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# Use of PSA and Safety Performance Assessment in Improving Regulatory Inspection System

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# 1. Introduction and Background Information

- **History and Current Status of PSA**
  - PSA has been one of licensing documents for new NPP since 1989
  - Severe accident policy statement announced in 2001, recommending
    - At least level 2 PSA be performed for all operating NPP by 2006
    - SAMP be developed and implemented for all NPP by 2006

- **Efforts to Incorporate Risk and Performance Information into Current Regulatory Program**
  - R&D for over 10 years by both regulator and licensee since 1996
    - A series of regulatory guides and methodologies developed
  - Several pilot applications

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# 1. Introduction and Background Information

- **Establish 1st Stage KINS RIR Implementation Plan**
  - Consisting of 4 Areas and 12 action items (See next slide)
  - Prepared by RIR task force team in 2005 and implemented since 2006
  - Considering existing regulatory environment and technical capability of both licensee and regulator
  - To be completed in 2008
- **Improving Regulatory Inspection Program**
  - Key action item in RIR implementation plan
  - 3-step approach developed and under implementation
- **Preparing 2nd Stage Implementation Plan**
  - To be implemented beyond 2009
  - Considering technical capability, applicability, consensus and need of nuclear society in Korea

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# 2. Risk-Informed Regulation Implementation Plan in Korea

## ▪ Implementation Items

| Areas | Items |
|---|---|
| A. Regulatory Inspection | A.1 Risk-Informed and Performance-based Inspection<br>A.1.1 Risk-Informed Periodic Inspection (RIPI)<br>A.1.2 Graded Periodic Inspection (GPI) |
| B. License Amendment | B.1 Risk-Informed Change of STI/AOT<br>B.2 Risk-Informed In-service Inspection for Piping (RI-ISI) |
| C. Technical Basis | C.1 Monitoring of Maintenance Effectiveness<br>C.2 Risk Monitoring System (RM) |
| D. Infra-structure | D-1 PSA Standards and Quality<br>D-2 Reliability DB<br>D-3 General Guidance for the Use of Risk Information |
| | D.4 Regulatory PSA Model (MPAS) |
| | D.5 Training Program for Regulatory Staff<br>D.6 Regulatory Decision-making Process<br>D.7 Legislation and Rule-making |

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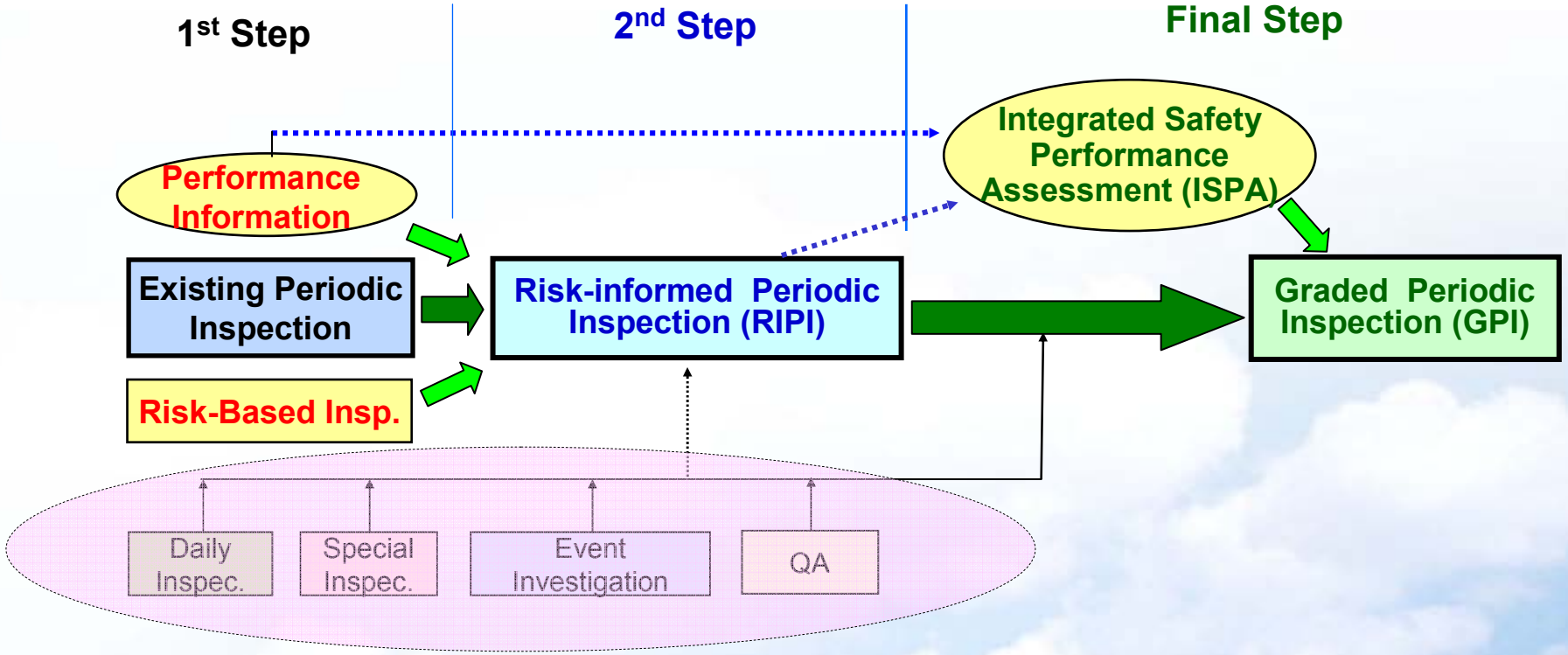
# 3. Improving Regulatory Inspection Program

## Three step approach

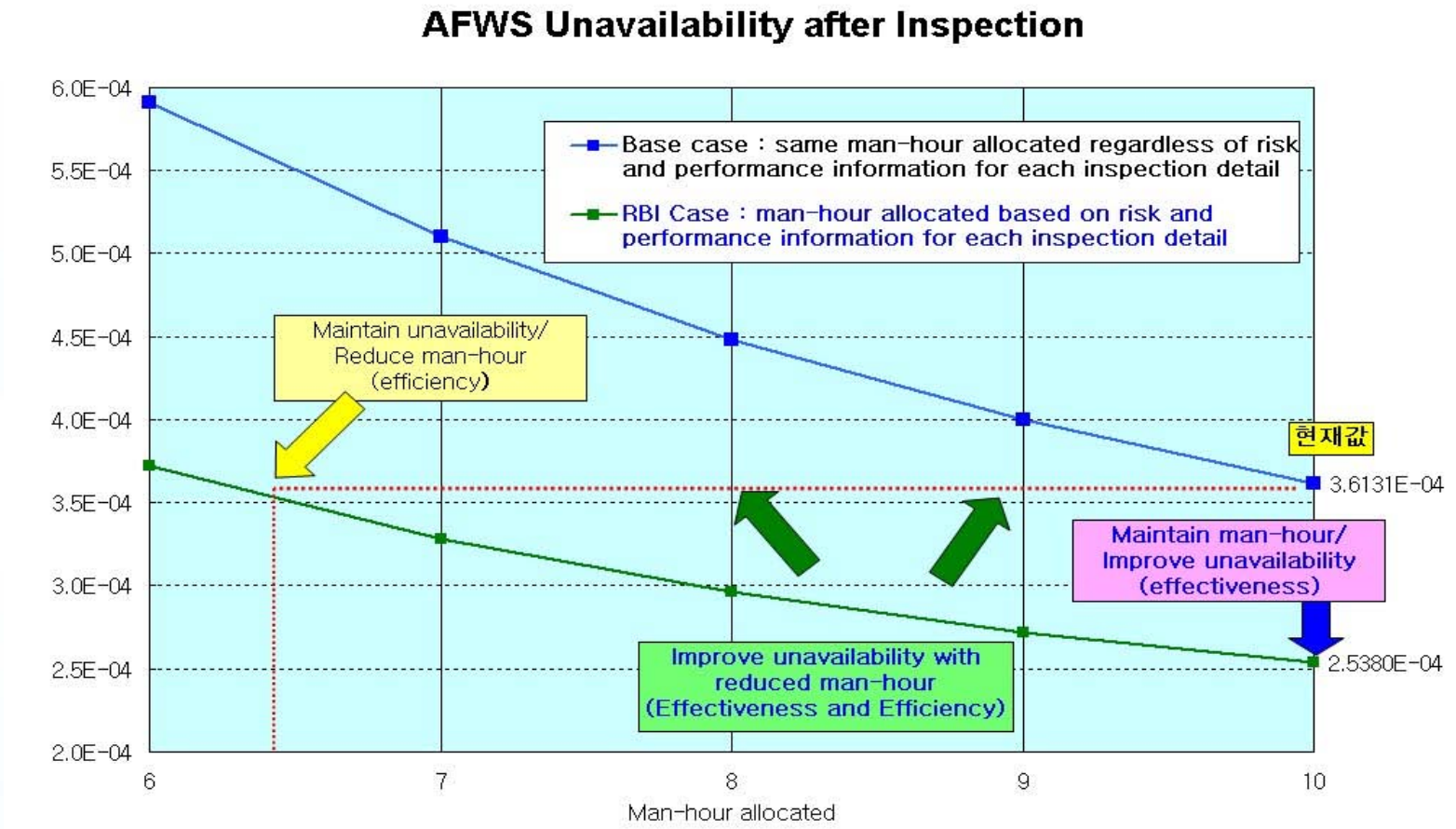


# 3. Improving Regulatory Inspection Program

- **Three Step Approach**
  - ***1st Step : Risk-Based Inspection (RBI) Program***
    - Developed and 2 times of pilot implementations done at full plant level in 2005 by NSC decision
    - Inspection items are selected based on risk significance
    - Inspection details developed considering risk and performance information
    - Inspection resources are allocated depending on risk significance
      ⇨ Result in the improvement of safety (See next slide)
    - Used as key input to develop the 2nd step RIPI program

# 3. Improving Regulatory Inspection Program

## *Effectiveness of Risk-Based Inspection Application*



# 3. Improving Regulatory Inspection Program

- **2nd Step : Risk-Informed Periodic Inspection (RIPI) Program**
  - Improve current periodic inspection program by incorporating RBI inspection items into relevant periodic inspection item
  - Inspection resources for each inspection item redistributed considering the risk significance and performance information (See next slide)
  - RIPI program has been implemented (and will be implemented) as regulatory inspection program for all 20 operating NPP since 2006
  - Key improvements focused on the prevention (or minimization) of highly risk significant
    - Common cause failures
    - Post-accident operator errors (i.e., EOP performance)
    - Root cause of independent failures

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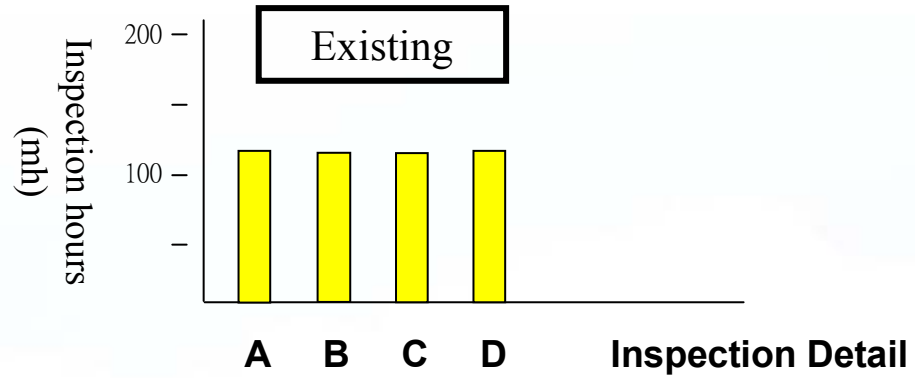
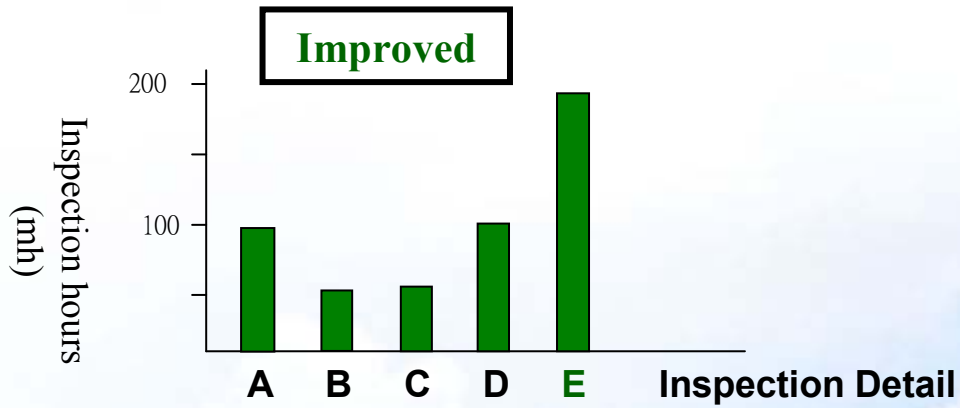
# 3. Improving Regulatory Inspection Program

## Main Idea for RIPI Program

- **Selection of Inspection Details and Inspection Hours for Each Inspection Item**




- Total hours fixed (500 mh)
- Selection of inspection Details (Items)
  - Existing : Deterministic
  - Improved : Deterministic, Risk-Informed and Performance-Based

# 3. Improving Regulatory Inspection Program

- **Final Step : Graded Periodic Inspection (GPI) Program**
  - To be implemented in 2010
  - Determine safety grade of each NPP based on the result of integrated safety performance assessment (ISPA) program (See next slide)
  - Inspection items and resources for each NPP will be increased or decreased depending on the safety grade of each NPP
  - GPI Program will be implemented in parallel with RIPI program
  - Contents of ISPA program
    - Risk significance of inspection findings
    - Risk assessment of operational accident/event
    - Risk-informed performance indicators
    - Maintenance effectiveness monitoring program
    - Assessment of licensee program
    - Risk monitoring results during power operation
    - Others (if necessary)

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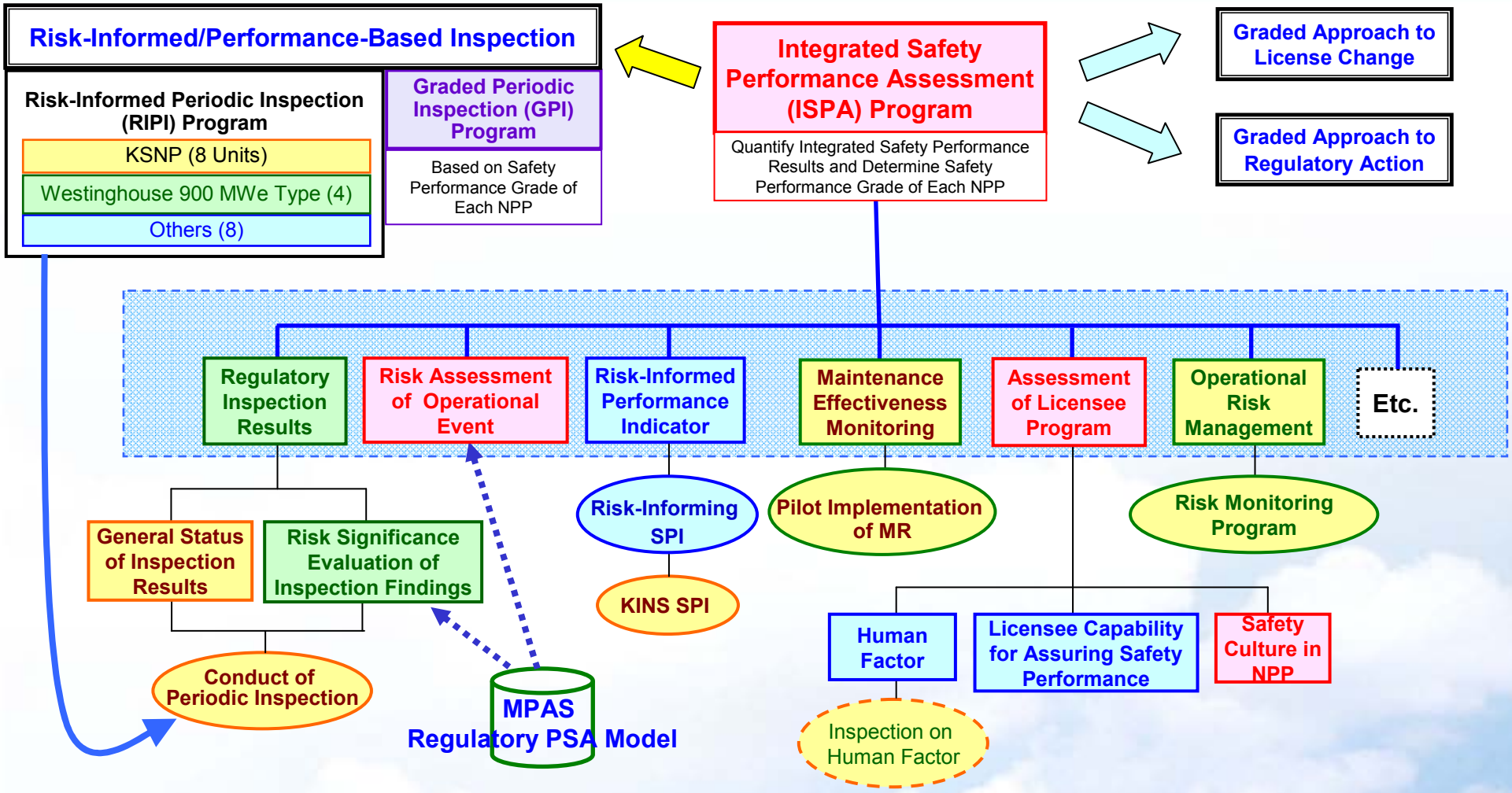
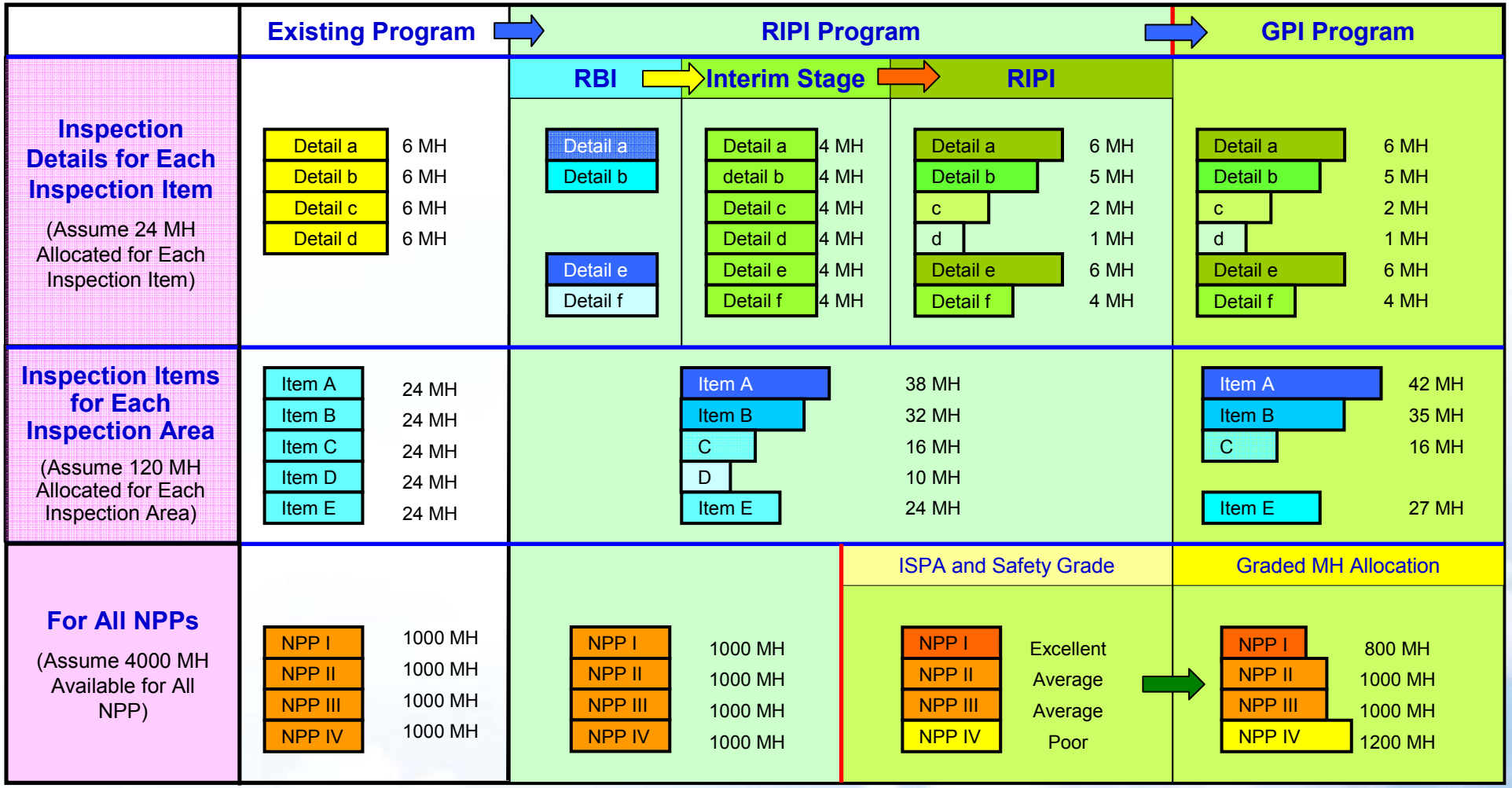
# Developments for Graded Regulatory Program



# Transition in Regulatory Inspection Program



# 4. Conclusions

- A comprehensive RIR implementation plan (1st stage) has been underway 2006, to be completed in 2008
- Also, the 2nd stage implementation plan beyond 2009 is under preparation
- In order to improve current regulatory inspection program systematically and consistently, three-step approach has been developed and is being implemented
  - The development and pilot implementation of 1st step RBI program at plant level
  - The 2nd step risk-informed periodic inspection (RIPI) program in progress
  - The final step graded periodic inspection (GPI) program and integrated safety performance assessment (ISPA) program under development

  ⇒ Direct more regulatory efforts to those NPPs of poor safety performance
- This improvements are expected to contribute to improving nuclear safety
  - by re-allocation of regulatory resources based on risk significance and performance information
- In addition, both the effectiveness and efficiency of regulatory inspection activities will be improved.

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