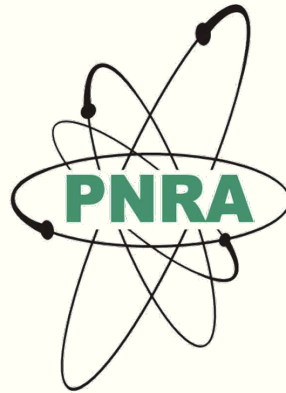


# ROLE OF INDIVIDUAL TECHNOLOGY AND ORGANIZATION (ITO) FACTORS IN MANAGING A NUCLEAR EMERGENCY



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***the Light of the Accident at Fukushima Daiichi NPP***  
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***Vienna, Austria***



# What I will present?

- **Introduction**
- **PNRA Regulatory Framework**
- **PNRA Core Functions**
- **Role of ITO in PNRA for the Unthinkable**
- **Role of ITO at Utilities for the Unthinkable**
- **Conclusion**



# Introduction

- **Individuals, technology and organizations (ITO) have their distinctive role in managing emergencies.**
- **In Fukushima accident, the apparent cause is known to be the natural hazard of scale greater than the design basis; however, detailed investigations carried out so far has pointed out inappropriate functioning of complex interactions among individuals (operators, emergency responders), technology (communication) and organization (emergency management, operator, government and specially the regulators).**
- **Based on the feedback of Fukushima Accident, actions have been identified both by the regulator and the utility in Pakistan in the form of Fukushima Response Action Plan (FRAP) to strengthen systematic interaction between individual, technology and organizational factors to manage the emergency during such kind of accidents.**



# PNRA Legal Framework

## Nuclear Safety

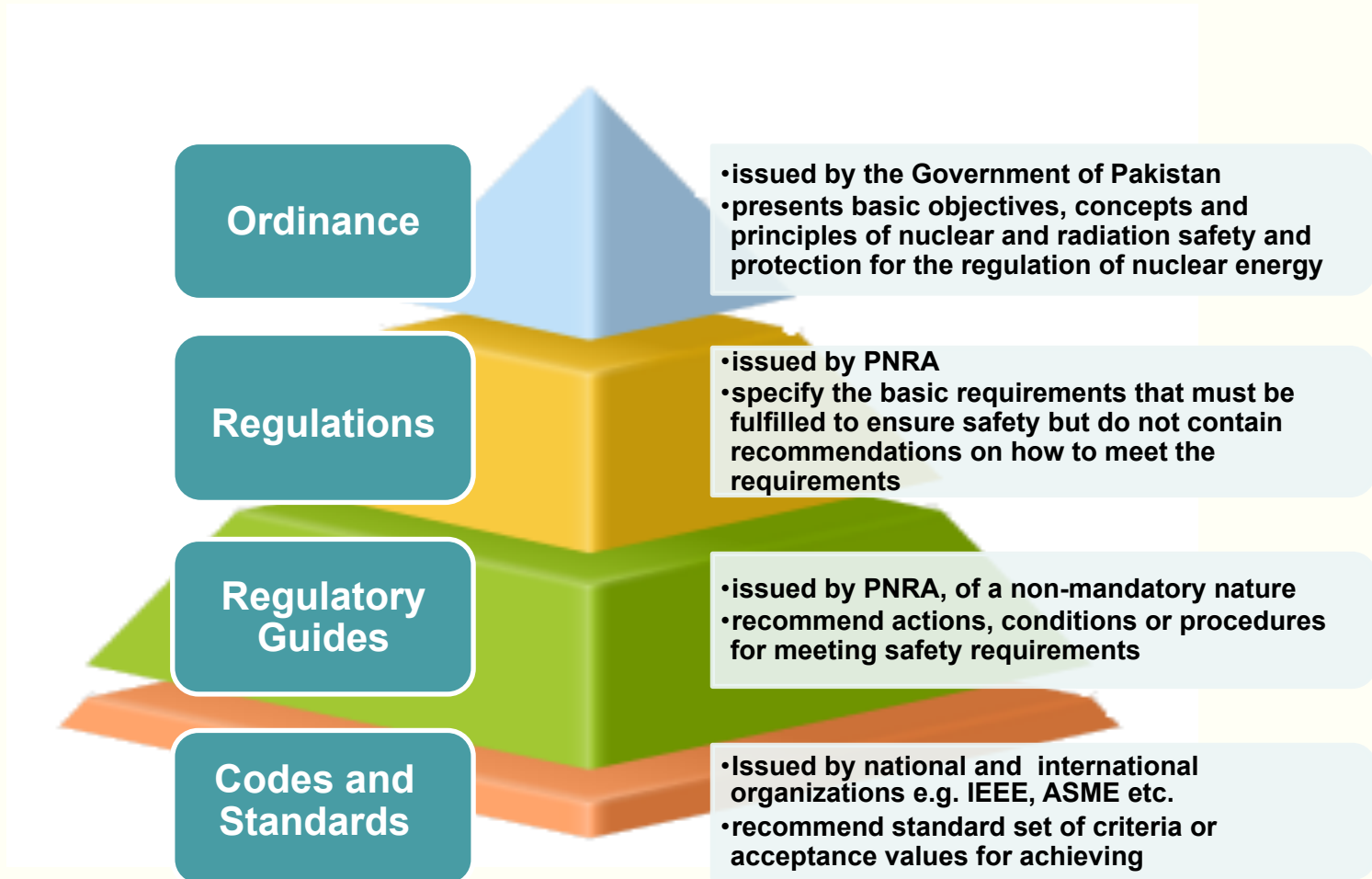
- PNRA Ordinance
- Safety Regulations for Nuclear and Radiation Safety
- International Bindings, i.e. Convention on Nuclear Safety

## Nuclear Security

- PNRA Ordinance
- International Binding e.g. Convention on Physical Protection of Nuclear Material
- INFCIRC-225
- Draft PNRA Regulation PAK/925 for Physical Protection of Nuclear and Radiation Facilities

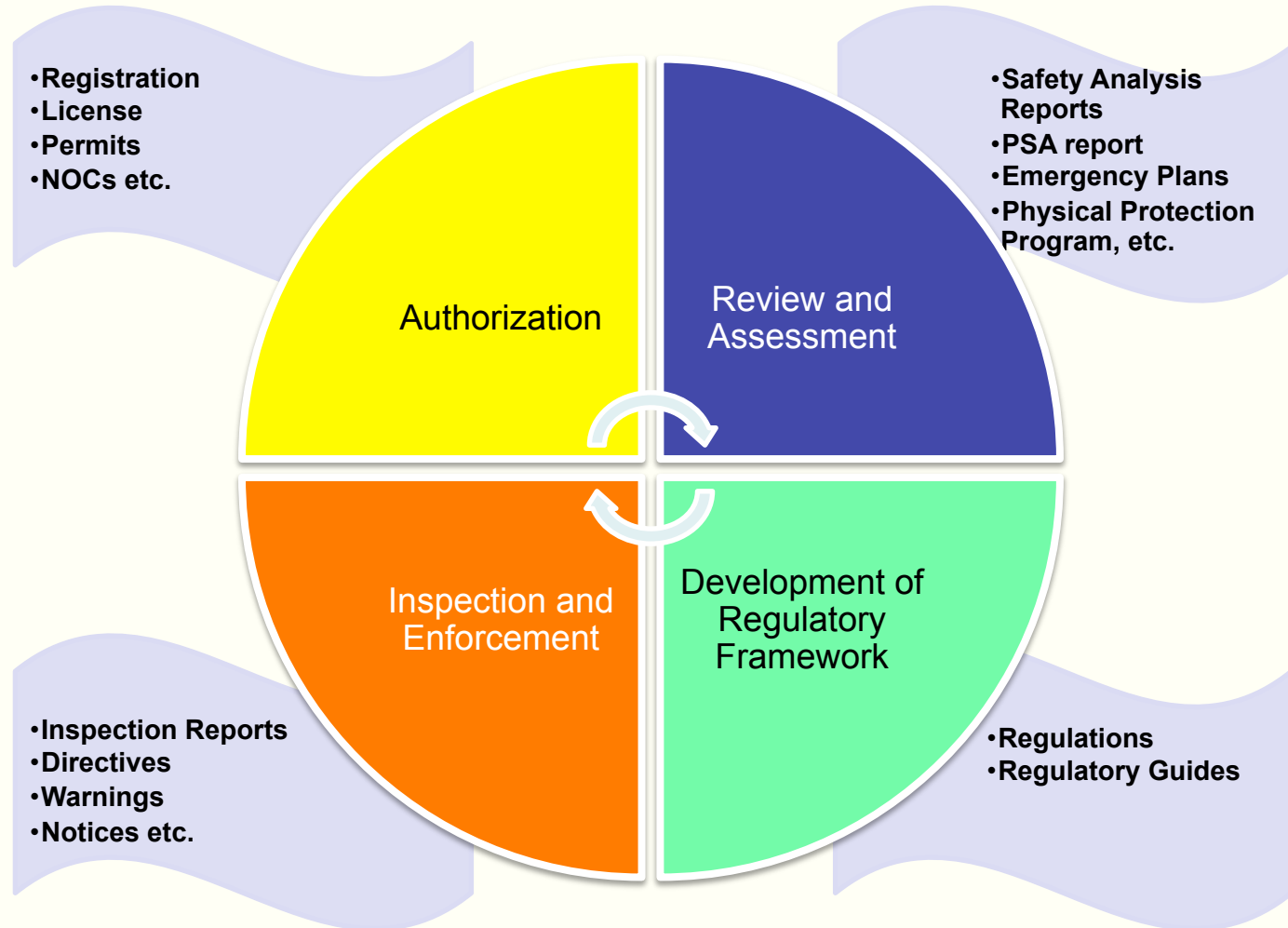


# PNRA Regulatory Framework



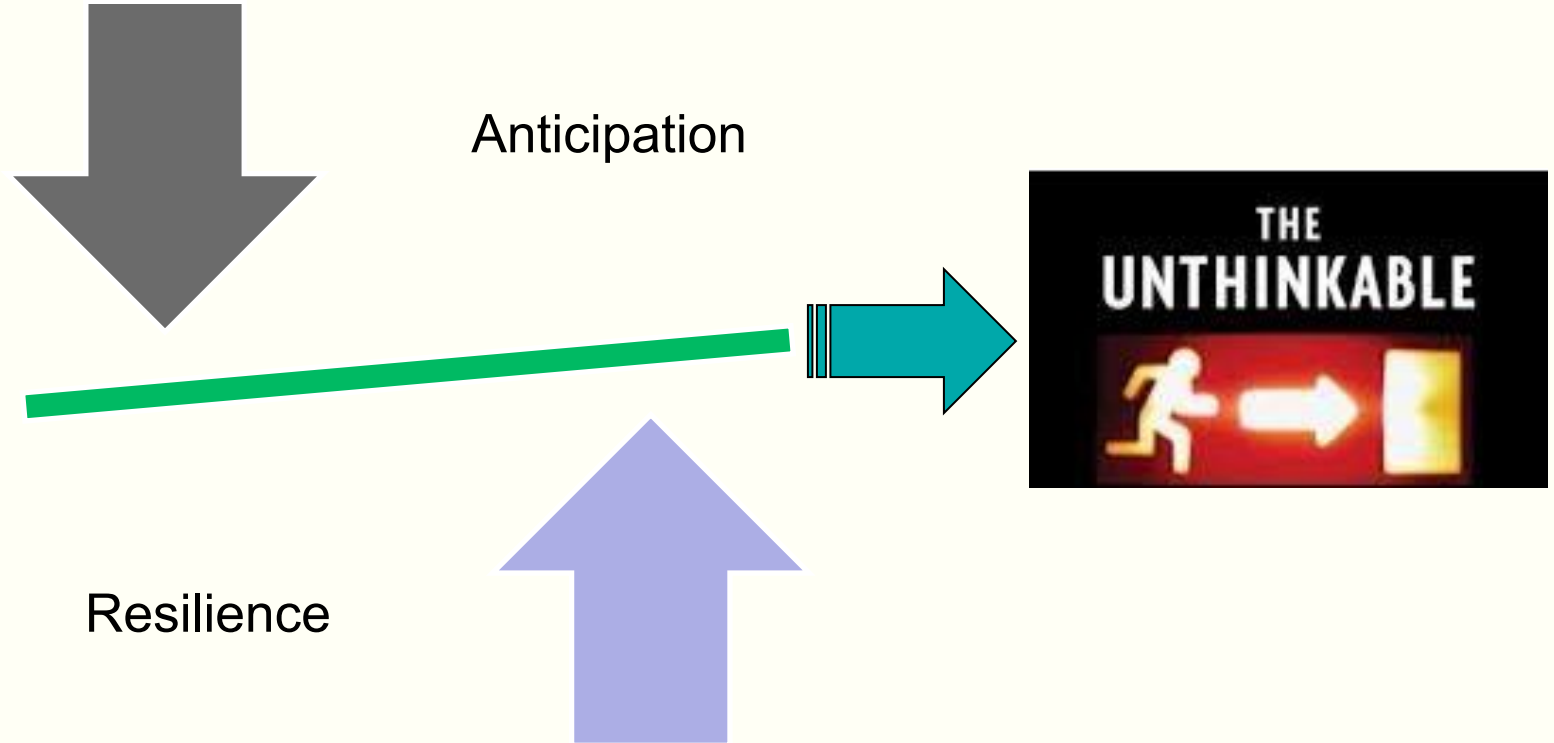


# PNRA Core Functions





# How can we manage the Emergencies





# Anticipation vs Resilience

- **Most organizations try to anticipate, prepare for, and prevent the unexpected through standard operating procedures, contingency plans, and the development of routines, but it has some drawbacks:**
  - Existing SOPs, protocols, plans cannot handle what they don't anticipate.
  - It is impossible in a dynamic uncertain world to develop SOPs to cover all possible cases, situations, events.
- **Then the path to safe and reliable operation in complex organizations in uncertain context is resilience, i.e. to develop a maximum capability to catch, correct, and learn from surprises as they arise - to develop a kind of intrinsic resistance to operational hazards, to deal with consequences after they become manifest.**





# Role of ITO in PNRA in Managing Nuclear Emergency

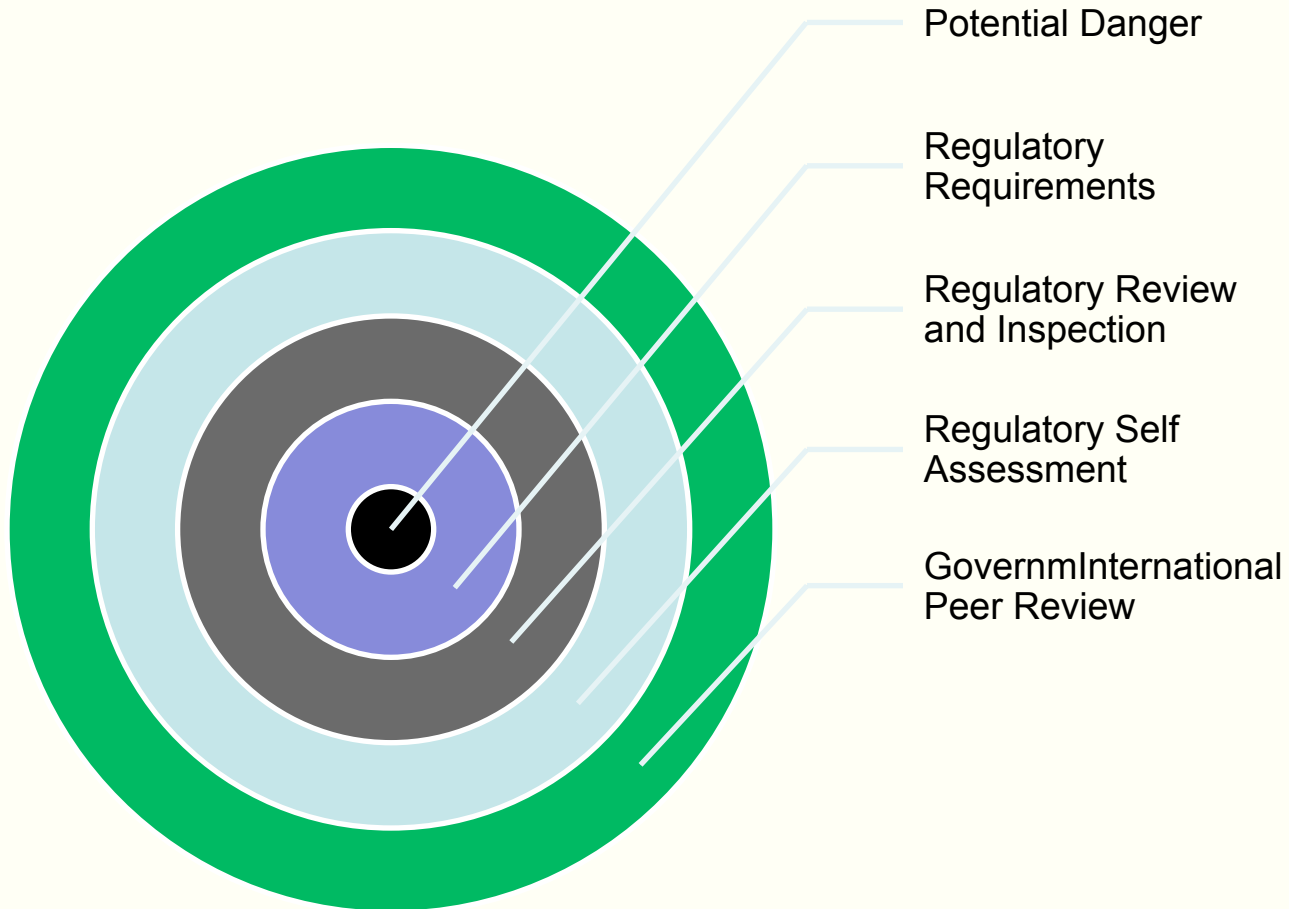


# Individuals

- **Based on the feedback of the Fukushima accident, utilities are enforced to:**
  - **Evaluate its training program from the view point of making further improvement to enhance the capability of its operators to understand and handle such situations;**
  - **Particular attention should be paid to the limitations of simulator as such scenarios may not be possible to simulate;**
  - **Special attention is being paid by utilities on the training of operators for the stress management and readiness for the unthinkable.**



# PNRA as a High Reliability Organization (HRO)





# PNRA as a High Reliability Organization (HRO) contd...

- **How can the Regulatory Body itself foster its own ability to manage the unexpected?**
  - **After Fukushima Accident, PNRA has reviewed its organization structure**
  - **PNRA has improved its Nuclear Radiological Emergency Coordination Centre (NRECC)**



# PNRA as a High Reliability Organization (HRO) contd...

## Regulatory Inspections



**Utilities**



**Regulatory Authority**



# PNRA as a High Reliability Organization (HRO) contd...

- **After Fukushima Accident, PNRA asked utilities that:** *The off-site emergency preparedness plan including Emergency Plan Implementing Procedures (EPIPs) needs to be re-evaluated and strengthened considering unavailability of necessary infrastructure (bridges, roads, communication means, etc.) in case of natural events well above the design bases (including a combination of such events) affecting all nuclear installations at the site and demonstrate implementation of the plan and EPIPs specially the evacuation. In addition, emergency planning zones may also be reviewed and re-evaluated to ensure that the zones have been adequately determined.*
- *The emergency operating procedures and severe accident management guidelines need to be reviewed again to verify whether such conditions are covered. In addition, such procedures and guidelines should be revalidated.*



# Use of State of the Art Technology

- The licensee shall make available the adequate tools, instruments, supplies, equipment, communication systems, facilities and documentation (such as procedures, checklists, telephone numbers and manuals) for performing the hazard assessment and managing the unexpected. These support items shall be located or provided in a manner that allows their effective use under postulated emergency conditions.



# Individuals

- **It was identified during the internal peer review process of Fukushima Action Plan that the trainings will be enhanced which includes the following:**
  - **Training for the MCR Staff in accident phenomenology and transition from SEOPs to SAMGs**
  - **Training for the technical support staff (more analytical in nature and include recovery and long term restoration and stabilization aspects)**
  - **Emphasis on simulator training for coping the unexpected and readiness for the unthnkable**





# Individuals (contd...)

- Training for the stress management considering the “Expect the Unexpected”



		URGENCY	
		High	Low
IMPORTANCE	High	<b>1</b> Urgent <b>and</b> important  Do it now	<b>2</b> Important <b>not</b> urgent  Decide when to do it
	Low	<b>4</b> Urgent <b>not</b> important  Delegate it	<b>3</b> <b>Not</b> important <b>not</b> urgent  Dump it
		Low	High



# Utilities as HRO

- **Review of existing offsite emergency plan and including involvement of external authorities such as; National Disaster Management Authority (NDMA) , District Administration, Law Enforcement Agencies (LEA), Met. Department, Para-military and military etc to improve the offsite response**
- **Develop flexible role structures and establish pockets of resilience such as ad-hoc problem-solving networks (increase ad-hoc training)**
- **Development of Safety Culture and its implementation, both in Licensee and the Regulator**
- **Use of well structured operating experience feedback and implementation of corrective actions.**
- **Identified short term, medium term and long term actions after Fukushima accident**



# Conclusion

- **The unexpected cannot be managed before it happens. If it could, it would not be unexpected!**
- **The unexpected can be managed (or controlled) when it happens, provided the organizations are prepared to do so.**
- **To manage the unexpected, the organizations must be able to respond and monitor in an effective and flexible manner.**
- **Before, during, and after the crisis, the organization must be able to anticipate and learn – and to monitor itself.**
- **To manage the unexpected, we must accept that it can happen – not through calculations, but by accepting that our ability to produce socio-technical systems exceed our ability to understand them.**



