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ONR case studies

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Case study #1

Fitting filtered containment venting (FCV) system on EPR

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Purpose of an FCV

- Following a severe accident prevent over-pressurisation of containment and catastrophic failure and uncontrolled release of radioactivity
  - Fuel melt and significant radioactivity release into containment
  - Significant steam generation inside containment
  - Significant pressure increase
- Release pressure to prevent catastrophic failure of containment
- Filter radioactivity – significant reduction in release of radioactivity

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FCV background

- End of GDA assessment finding raised
  - Examine measures to limit pressure in the containment
- Affects civil construction → early resolution required
- Post Fukushima → FCVs being retrofitted across the world
- EPR has alternative means to control pressure → spray water into containment
- But needs electrical power to operate …
  - The event initiating the severe accident could have rendered all power sources unavailable
- Additional enhancements added post-Fukushima

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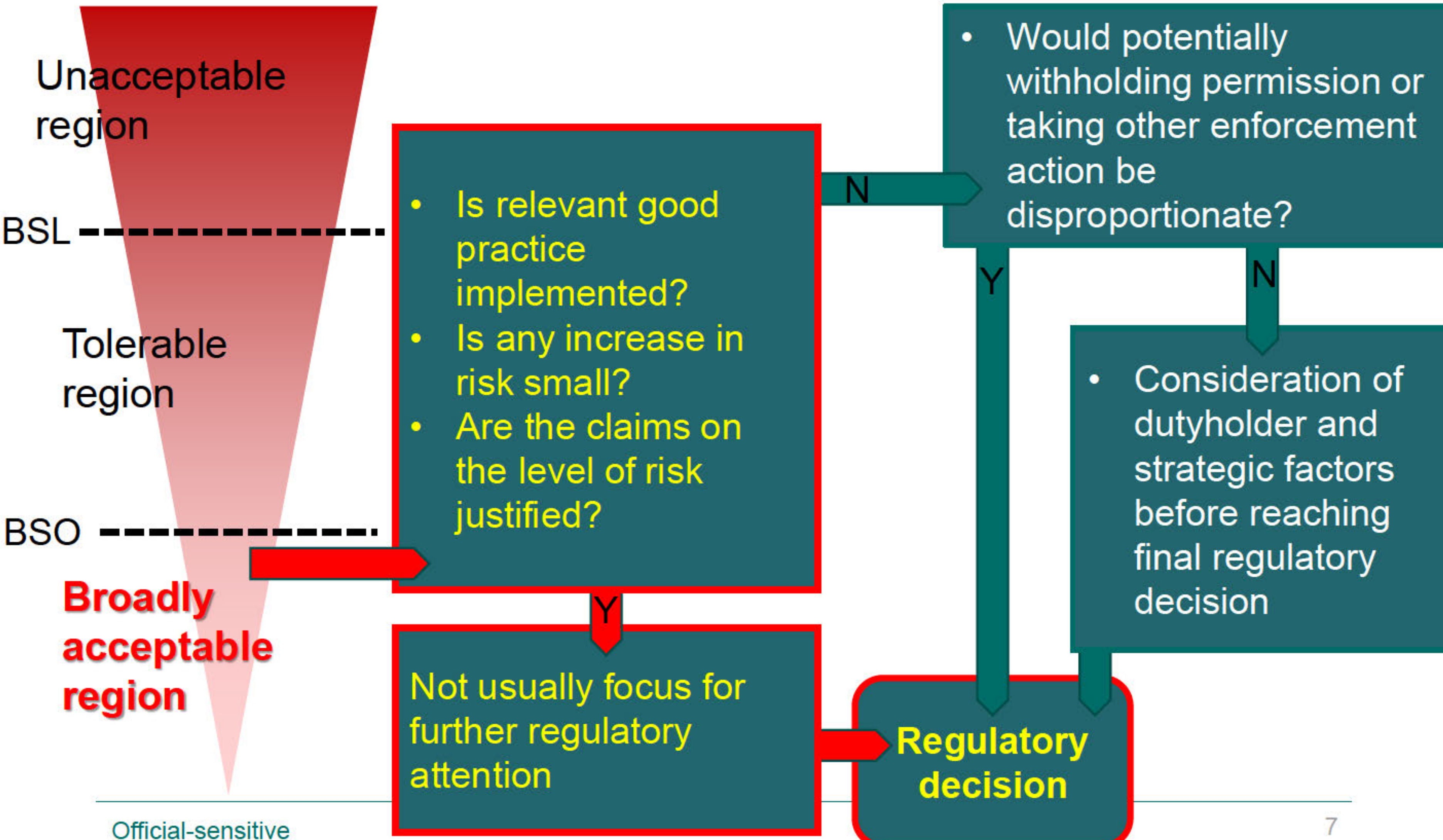
Application of RIDM



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Case study #2

Grouting under HOR (raw water supply and storage building) at HPC – ongoing

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What is HOR building?

- Class 1 structure with resilience to severe (low frequency) hazards
  - 90x52m
  - 16.2m tall (2/3 buried)
- Protects class 3 systems

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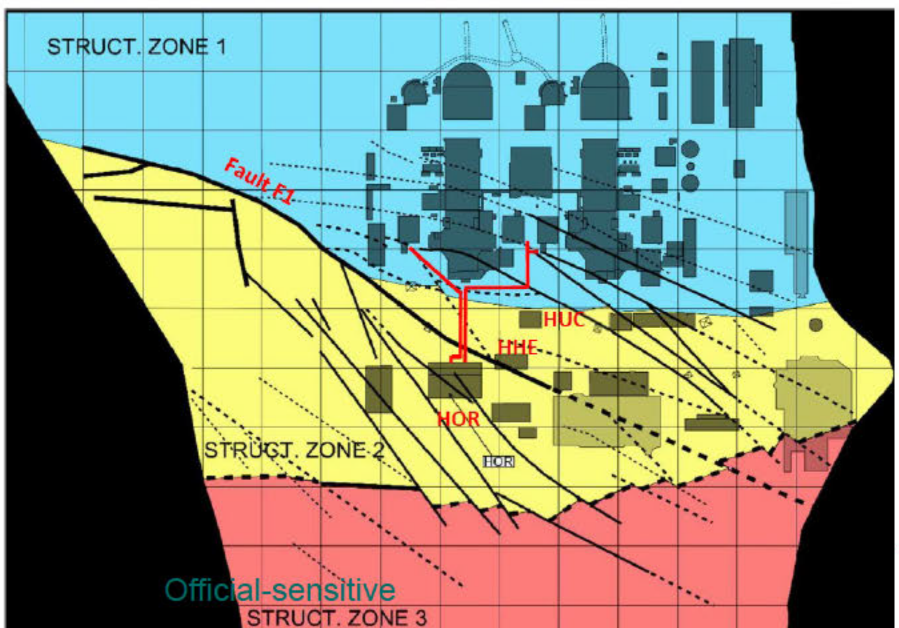
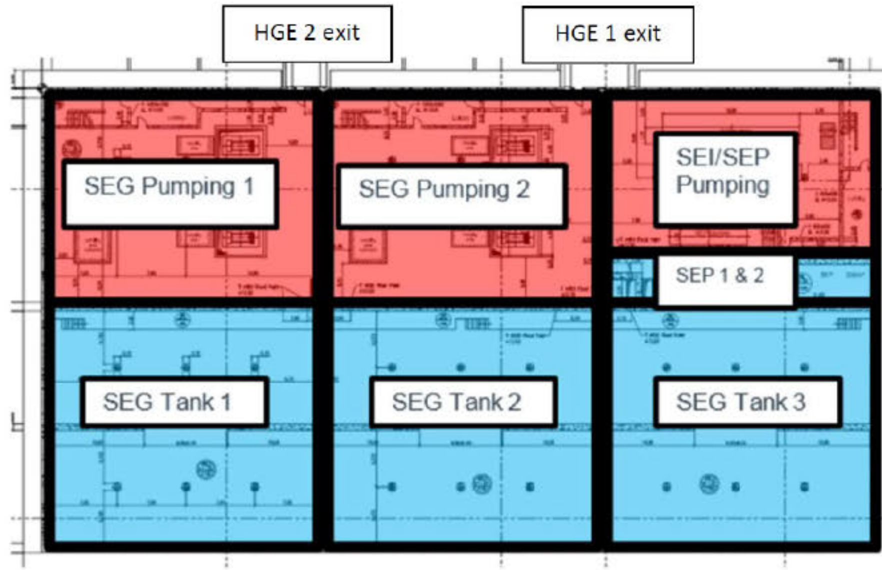
Water Tanks

Pumping areas





- Provides defence in depth to low frequency events, especially where main safeguard systems failed due to total loss of ac power (TLAP)
  - Post Fukushima enhancements
  - Diverse feed system
  - Containment water injection
  - Top up spent fuel pool

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What is the issue?

- Due to ground condition (blue anchor formation) → voids in ground underneath where HOR is to be constructed
- Potential for void collapse under certain low frequency seismic events
  - Uncertainty over impact on structure and whether it can fulfil its safety function
- Safety functions required in beyond design basis events to either prevent a severe accident (diverse feed system in TLAP) or prevent containment overpressure (in TLAP)
- Decision previously made to grout (fill) the voids, which has been done under HGE (underground gallery that contains the pipework from HOR)
- Due to increased costs and schedule impacts no grouting option being reconsidered by NNB GenCo

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Case study #3

Spent fuel export on ABWR

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Overview of fuel export

- Elevated spend fuel pool in ABWR design
- Requires 21m lowering of spent fuel cask to remove from reactor building
- Consequences if cask dropped and breached – large release and potential for fatalities

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Key considerations

Relevant good practice
- Common practice across BWRs
- Enhancements made compared to other BWRs
- RGP considered
- Consistency with key engineering principles

Claims on cost and level of risk
- Frequency of event very low (1 in 100 million per operation)
- Risk of operation below 'BSO' and small proportion of overall plant risk
- Cost screening → further engineered measures likely to be 'grossly disproportionate'

Support ABWR position that fuel export with proposed enhancements acceptable
- Further detailed challenge not proportionate
- Subject to demonstration of low likelihood – effectiveness of impact limiters and cask withstand

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Cost screening

- Risk estimates together with accident consequence costs may be used to calculate what it might be worth spending
- When this "screening figure" is low it can indicate no further reasonably practicable improvements
- Approach is acceptable provided:
  - Established RGPs not overridden
  - Risk & cost estimates are justified
  - Adequate consideration of sensitivity/uncertainty

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Extra slides

RIDM

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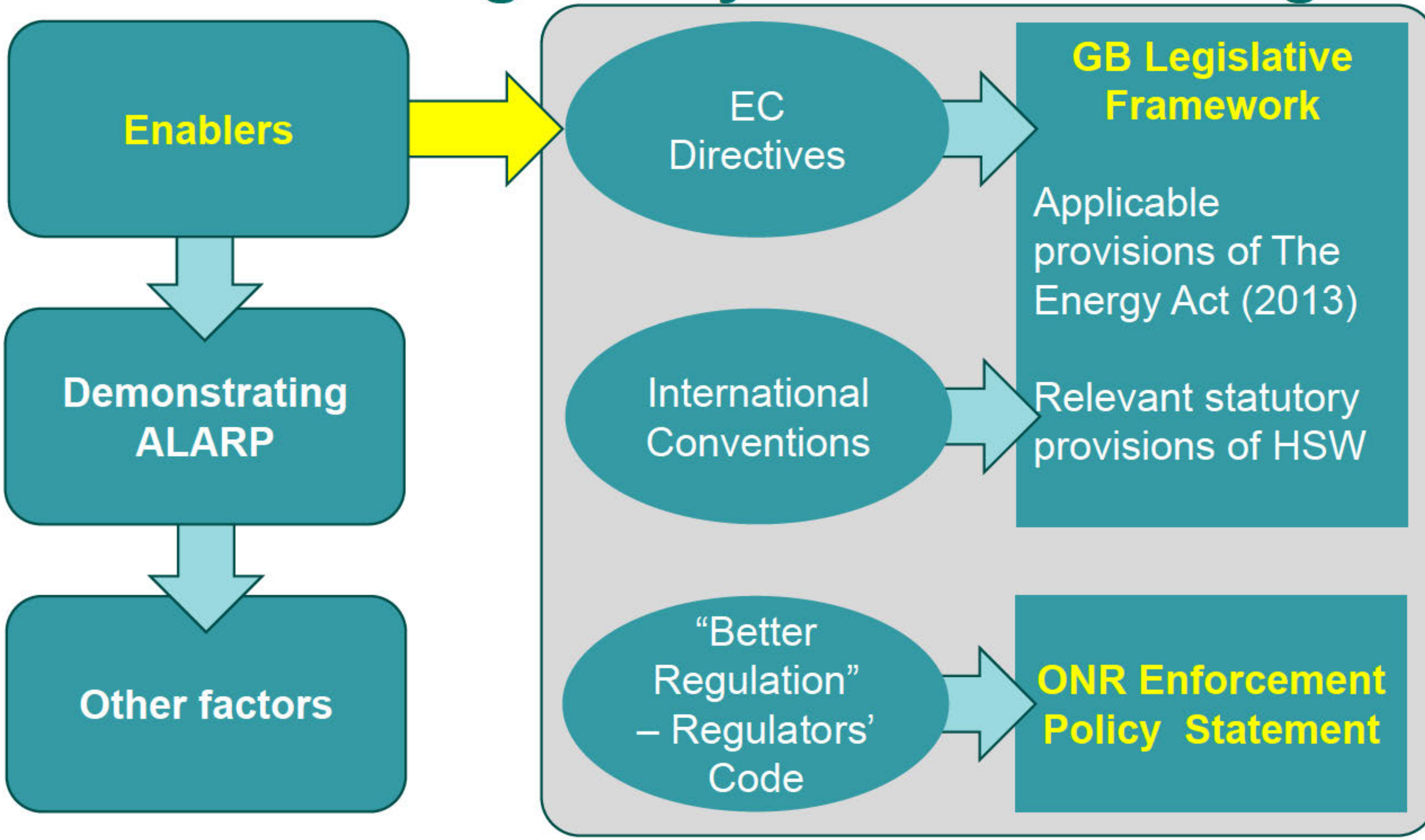
Overview of regulatory decision making



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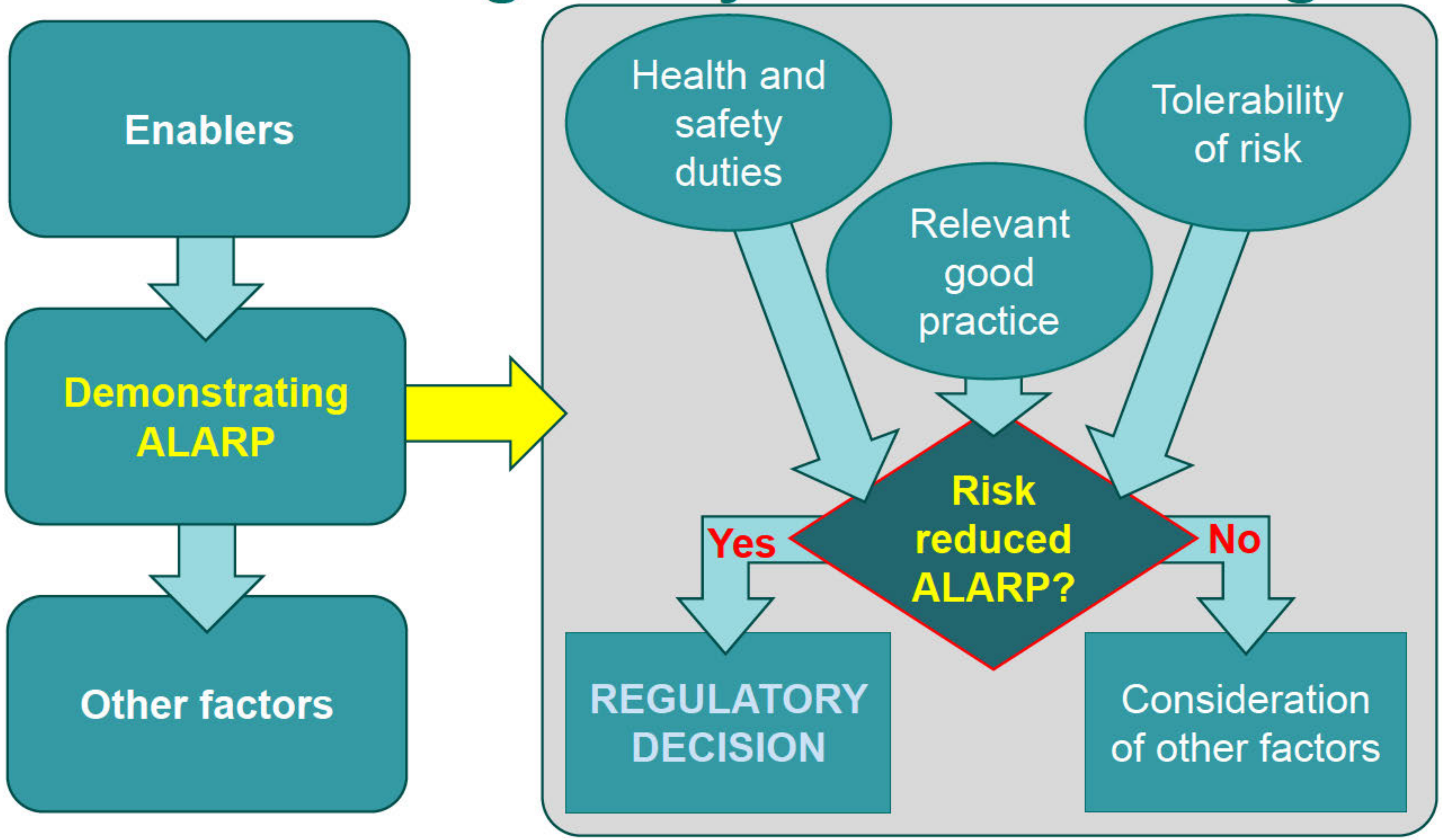
Overview of regulatory decision making



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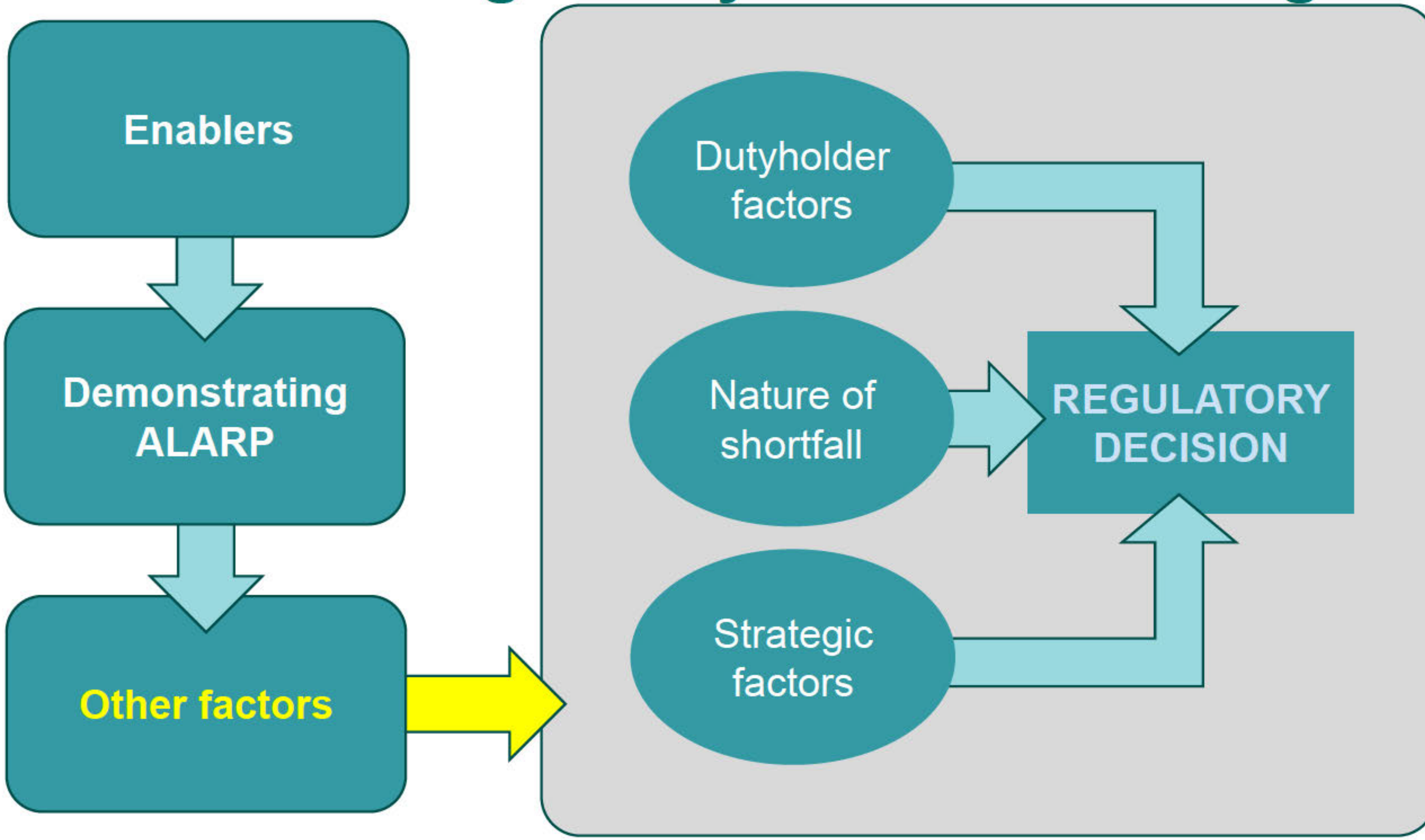
Overview of regulatory decision making



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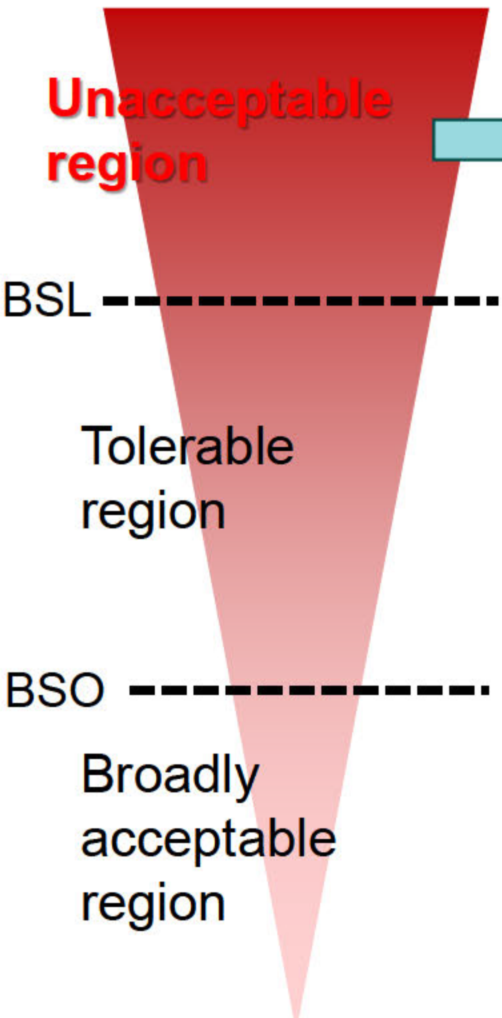
Role of TOR framework



- Are there exceptional circumstances?
- Is the dutyholder's position robustly demonstrated, for example a strategy to deal with the hazard in the long-term?
- Are there no further options to reduce risk in the short-term?

- Focus of regulatory attention
- Likely gap regarding compliance with ALARP
- Understand the nature of the risk and the dutyholder's control of the risk

- Consideration of dutyholder and strategic factors before reaching final regulatory decision

Regulatory decision

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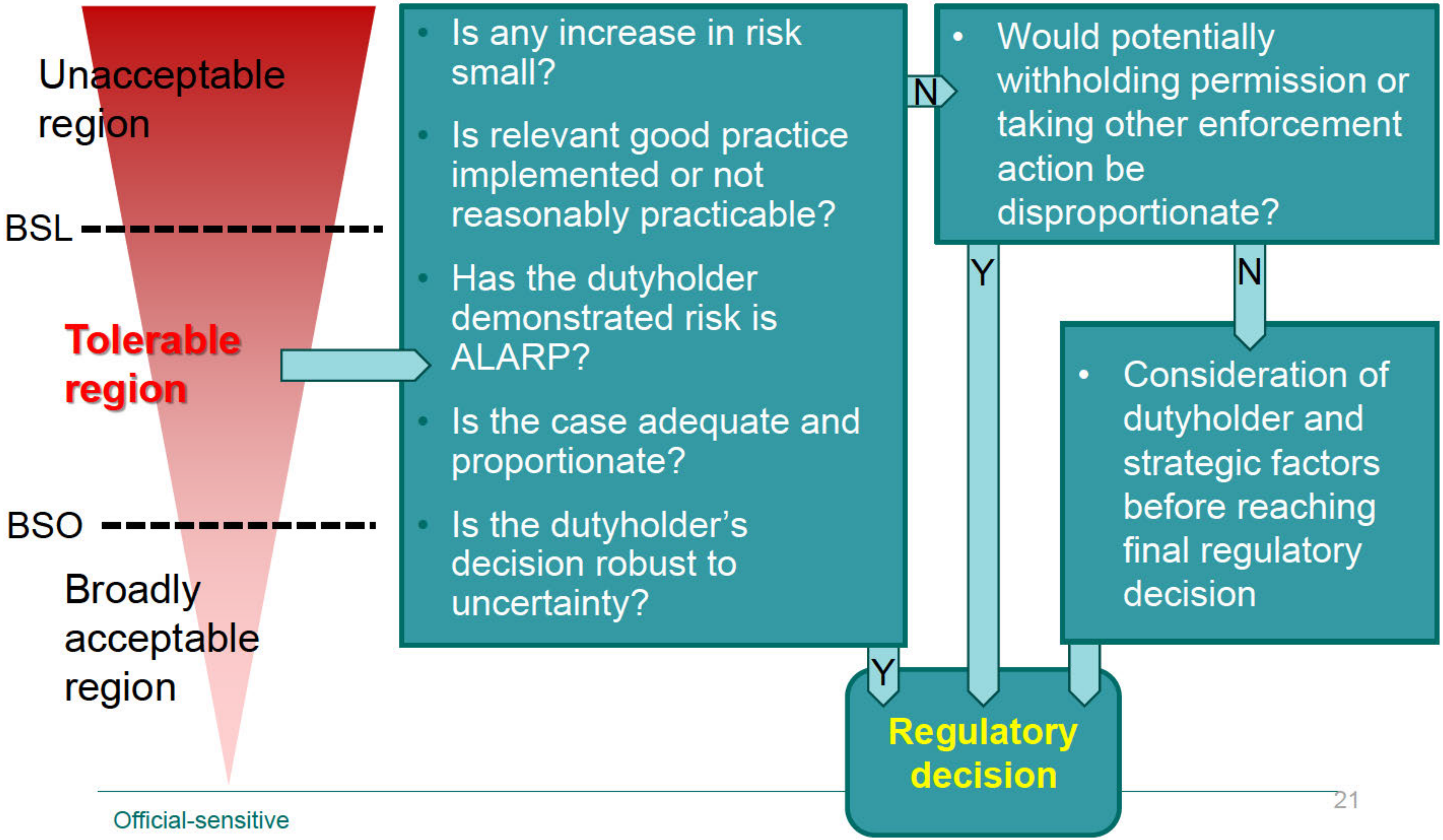
Role of TOR framework



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Role of TOR framework