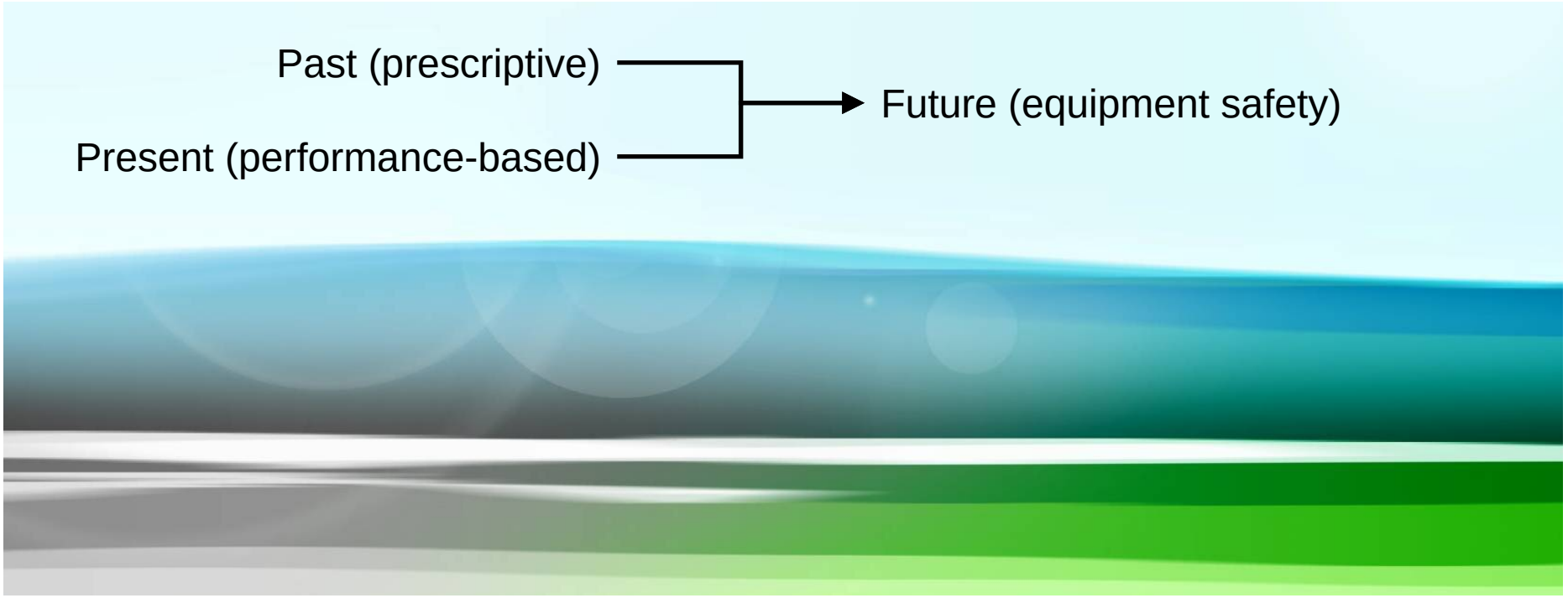


Equipment Safety - Balance Between Risk, Condition and Control

Lafayette BOEMRE Forum – Sept 13, 2010

Bryce Levett, Director of Energy Solutions, Energy North America

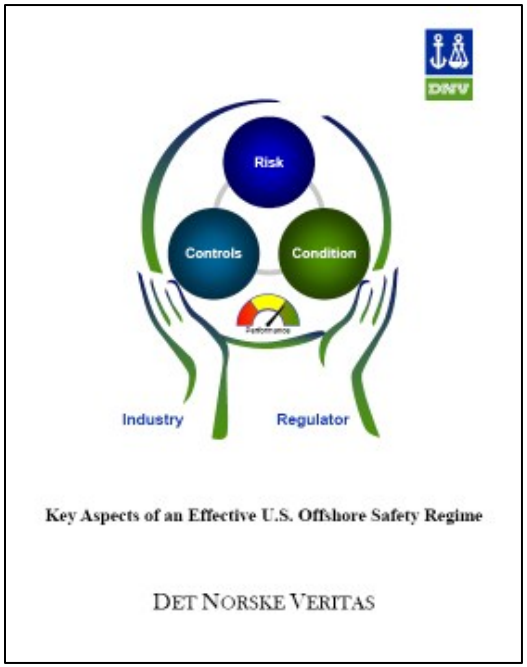
MANAGING RISK DNV

Key Points

- DNV credentials
- The barrier approach
- Balancing risk, condition and control
- Regulation – blend of prescription and performance
- Clear roles – BOEMRE and Industry

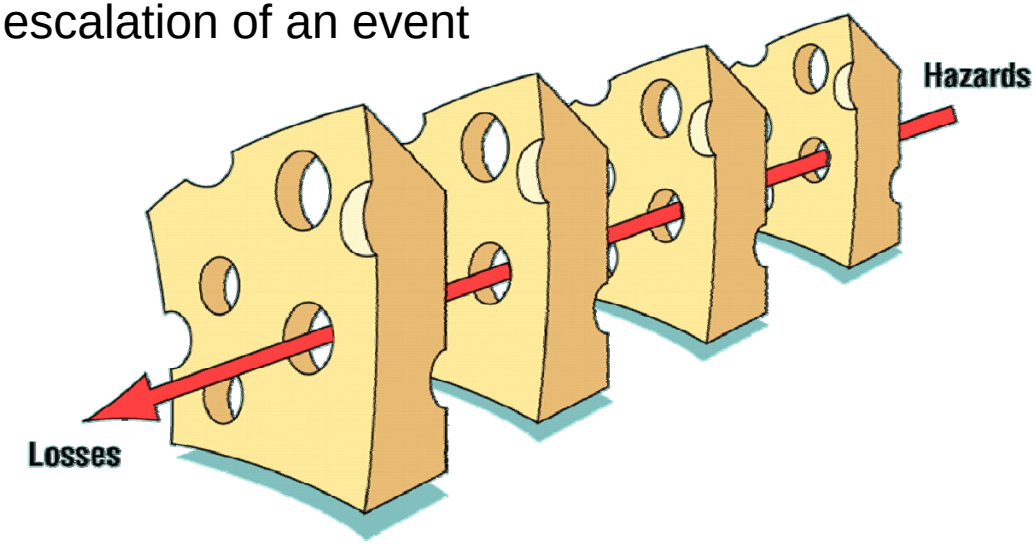
DNV Credentials

- Det Norske Veritas is a maritime and offshore Classification and safety company
  - Founded in 1864 with Corporate mission "***Protecting Life, Property and the Environment***"
  - 9000 total staff – 800 in USA
  - Array of services focused on offshore safety and environment
    - Offshore Classification with specific DRILL Class Notation for GoM
    - Approved for CVA Role – Certified Verification Agent
    - Structural and stability assessments
    - Safety assessments – fire and explosion risk, escape and evacuation studies
    - Safety and environmental management system reviews and certification
- Recent major contributions on offshore safety
  1. DNV Position paper on Effective Offshore Regulatory Regime (July 2010)
  2. Comparison USA and Norway drilling regulations (Aug 2010)
  3. Major Blowout Environmental Modeling – Nordland (Apr 2010)
  4. Launched JIP for Advanced Well Management (Aug 2010)
  5. Recommended Practice for BOP Recertification in GoM (June 2010)
- DNV creates, integrates and shares best global practices
  - DNV helps to create solutions with the industry
  - Currently running 100+ Joint Industry Projects (research projects)



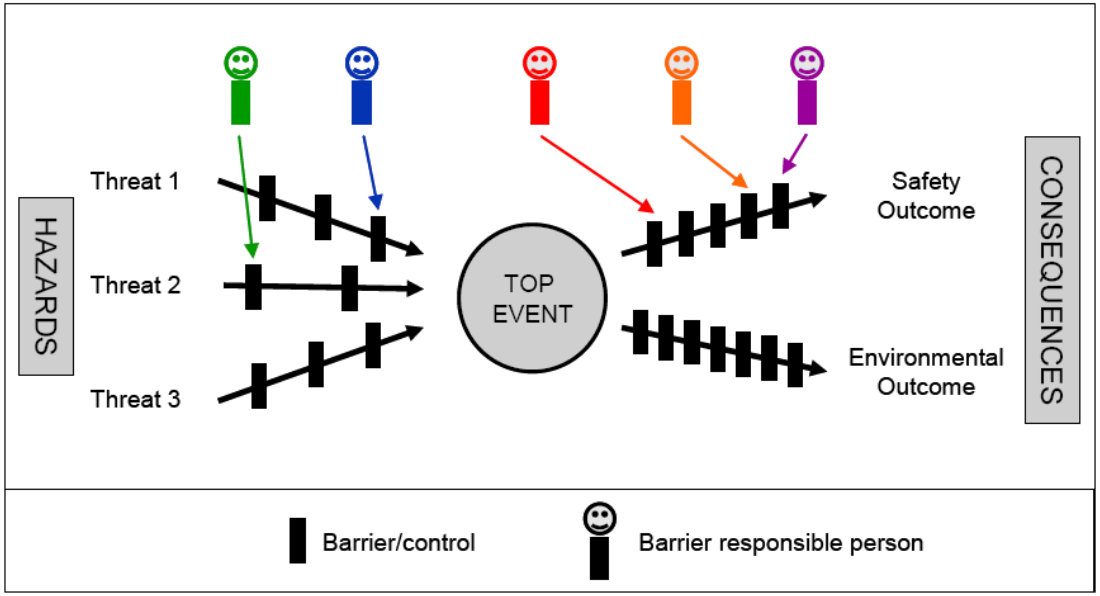
Equipment Safety – Think Barriers

- Most accidents have been demonstrated to be due not to an unforeseen threat, but due to a known threat adequately addressed by regulations and company requirements, but where the safeguards have been allowed to degrade over time (technical, human or organizational).
- Equipment should be thought of in terms of their role as a barrier either:
  - Preventing a threat from becoming an accident or
  - Preventing an escalation of an event



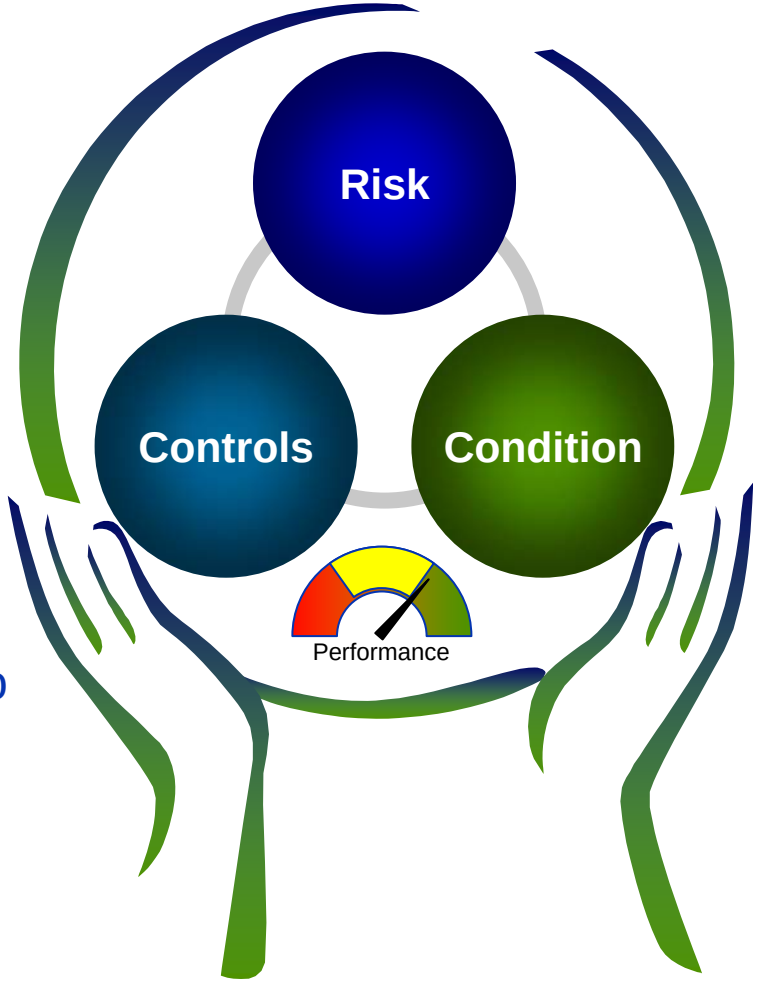
Equipment Safety – Think Barriers

- 3 components of the barrier role
  - Required performance – what does it need to do?
  - Ownership – who has responsibility for its condition and performance
  - Clearly understood relationship to threat and other barriers – how does the picture change if the barrier is removed or is diminished?



Performance Through Balance

- Equipment performance is established through equivalent focus on:
  - Risk – what are the threats or event escalation (project specific) that the equipment needs to address?
  - Controls – what mechanisms are or need to be in place that affect the equipment such as design standards, regulations and SEMS?
  - Condition – what kind of monitoring is needed to detect failure or degradation?
- All 3 elements must be given equal attention



Revised Regulatory Regime

- An effective regime is a blend of prescriptive and performance-based rules
- Prescriptive rules
  - Specific rules defining baseline for technical solutions
  - Applicable rules and standards are driven by or address historical threats
- Performance-based rules
  - Regulators define specific objectives
  - Operator must demonstrate technical solution addresses threats
  - Safety case concept is fundamental to this structure

Revised Regulatory Regime

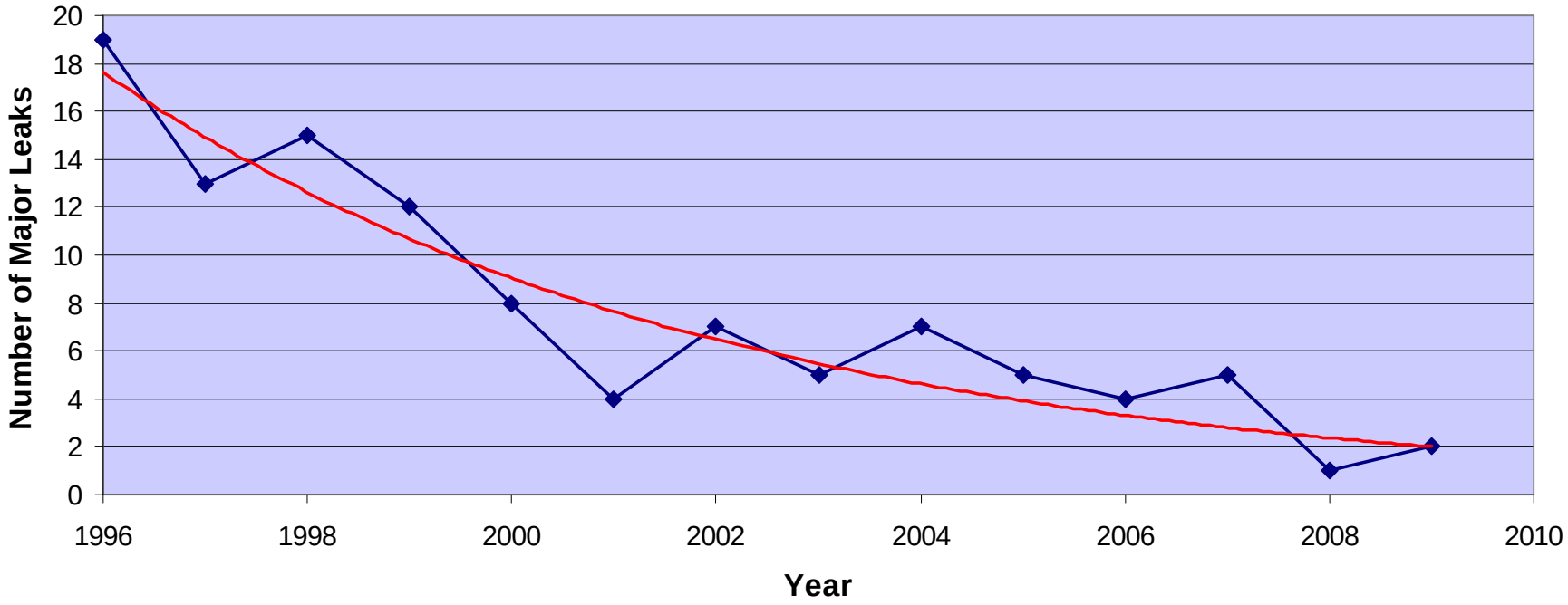
- Pitfalls of a singular approach
  - Regulations and standards can be lagging to industry practice – API 16A shear ram test
  - Pure performance-based creates potential imbalance – too much effort on baseline/historical threats versus project specific threats
- Advantages of a blend
  - Prescription guarantees lessons learned and good practices are included
  - Performance-based adds facility specific or novel risks, appropriate controls and condition monitoring beyond prescription

What the O&G & Process Industry has achieved

- North Sea major accident safety has improved
  - No major disaster since introduction of Safety Case / risk based legislation in UK / Norway (leaks have occurred, but none escalated)
  - Reducing trend in Major hydrocarbon leaks (factor of nearly 10 in last 14 years)

UK North Sea Major Leak Trends

Source: UK HSE HCRD Dataset

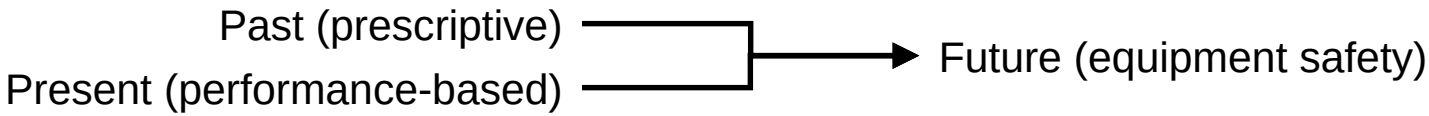


Clear Roles and Responsibilities

- In a Safety Case-style regulatory regime
  - Operator demonstrates the high level of safety that will be achieved and maintained
  - Operator owns the overall risk and the Safety Case
  - Regulator should review and accept a Safety Case, but not approve it
- Industry has deeper knowledge of hazards and risk management
  - New wells or development approaches can introduce novel hazards
  - Industry can carry out risk assessments, define necessary controls and monitor conditions
- BOEMRE and USCG have specialist manpower (limited in number)
  - Focus building skills in performance-based regulation in addition to prescriptive
  - Regulator ensures competence of those doing inspections (both itself and 3rd parties)
- Role for independent 3rd parties in both Industry and Regulatory

Conclusion

- Equipment safety achieved through understanding role as barriers and clearly defining:
  - Required performance
  - Ownership
  - Relationship to threat and other barriers
- Performance defined by risk, condition, control (captured in Safety Case)
- Blend of prescriptive and performance-based regulations



- Clear roles – BOEMRE and Industry
  - Operator owns & demonstrates
  - Regulator reviews & accepts
- Independent 3rd parties can bring something to both tables

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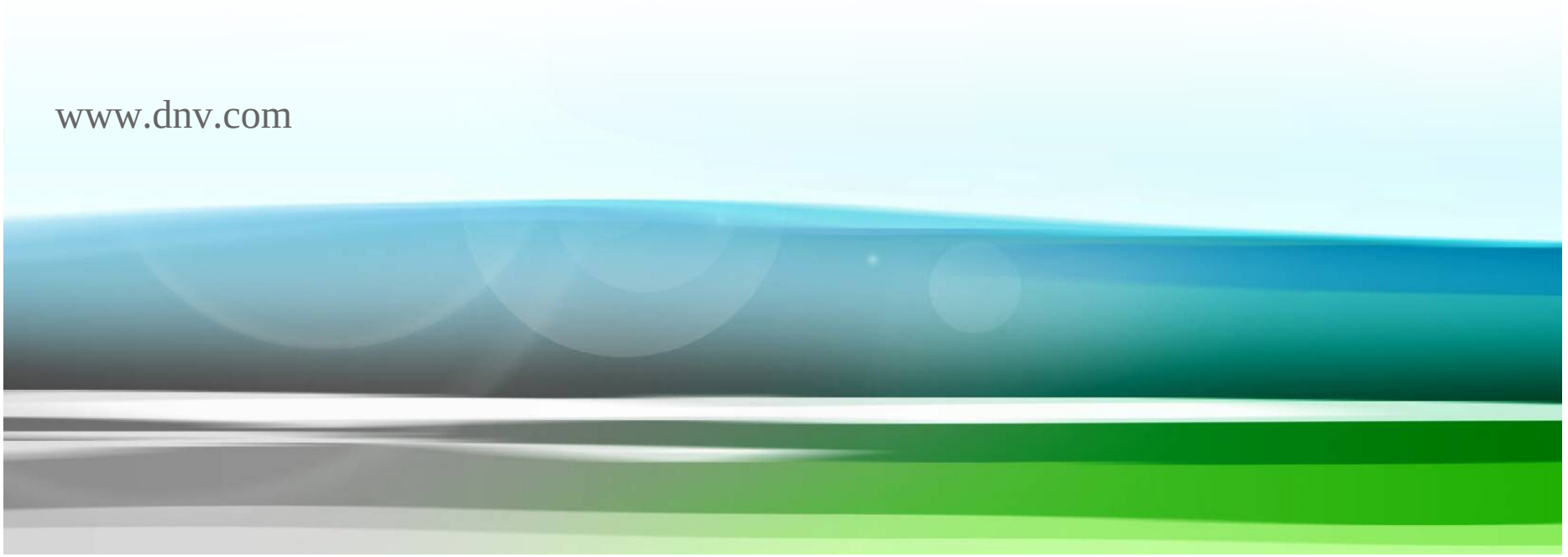

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