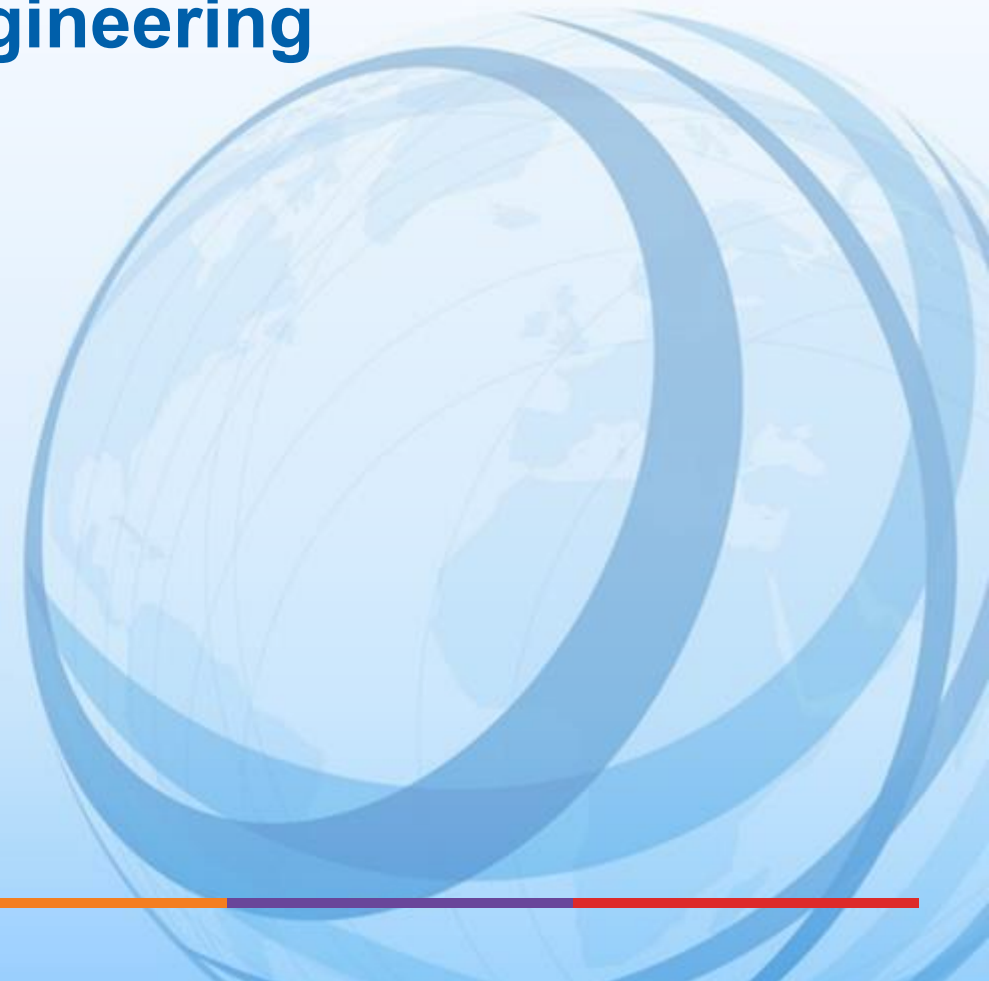


Unlocking the Value in Insurance Risk Engineering

Dr Divine Obenndip

CEng MEI MChemE MIFSM PPSE

Head, Engineering Risk Consultants



ERC Core Activities



Each Year visit 20-30 locations

- Worldwide locations
- A variety of occupancies
- Assets with insured sums > USD 100 million



Review Accident & Loss Reports

- Lessons learned



Write & Review Risk Engineering reports

- Incorporating global best practices



Expert Led Training

- Industrial safety
- Process safety
- Loss prevention principles

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Considerations

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Risk Engineering

- Why do we need Risk Engineering?
- What occupancy classifications do we have?
- How do we analyse and quantify data?
- What do we learn from losses?
- How do we communicate the risk?

Loss Prevention & Control

- Management systems
- Detection & Protection systems (Passive/Active)
- NATCAT Exposures
- Business Continuity

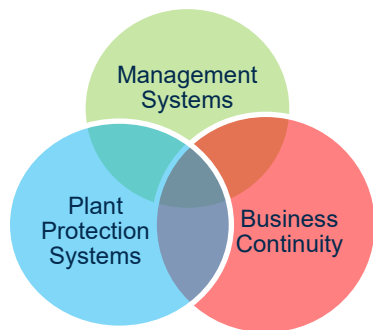
Potential Loss Estimation

- How do we define potential losses?
- What are the common potential loss scenarios?
- How do we calculate potential losses?

Risk Engineering

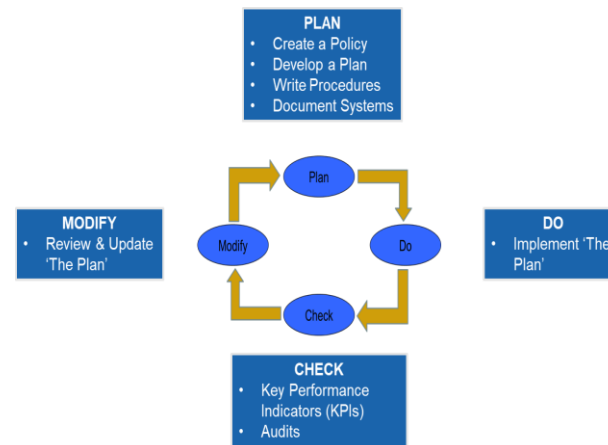
Why do we need it?

- Favourable Risk = Maximise Profitable Participation
- Prevent or Mitigate Losses
- Identify risk improvement opportunities
- Identify and Validate Loss Scenarios
- Quantify loss estimates



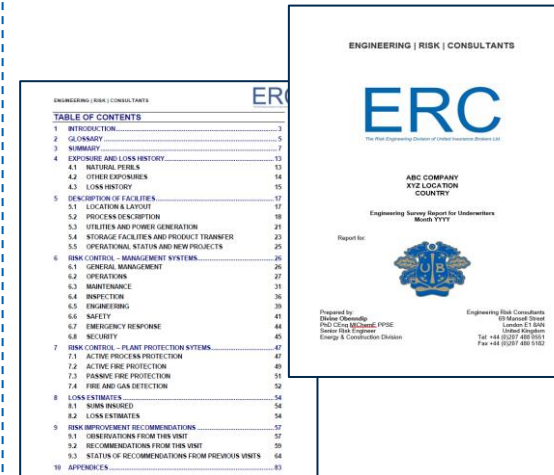
How is it done?

- Analytics/Modelling
- Loss history/Claims
- Risk Profiling
- Plan Reviews
- Site Surveys



How do we communicate the risk?

- Risk Ratings
- Secondary Modifiers
- Loss Prevention Recommendations
- Risk Engineering Survey Reports



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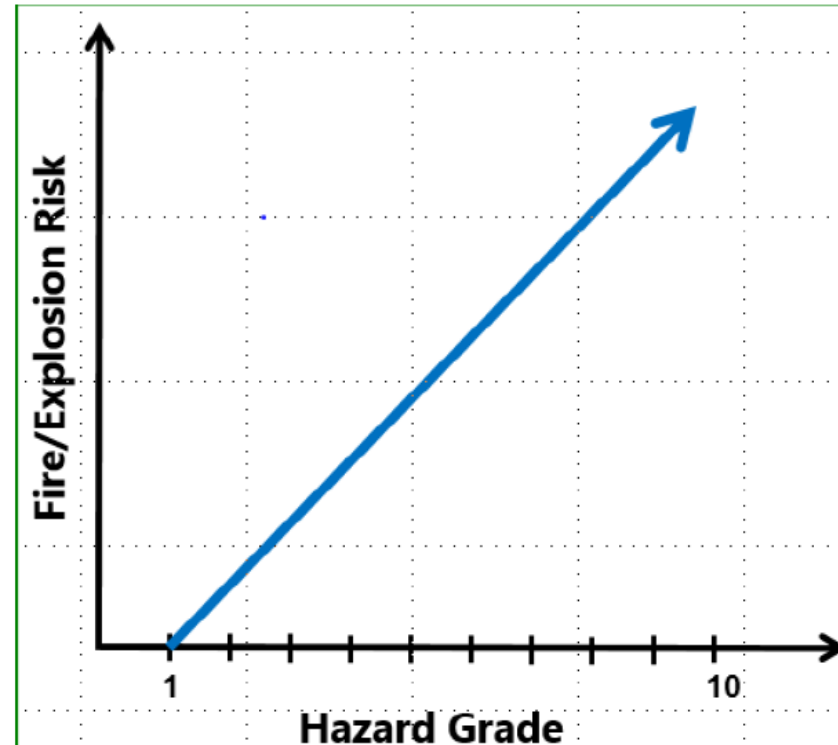
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Occupancy Classification

- Occupancy can impact
 - Capacity, Technical Rate, Deductibles, Insurability
- Classification is based on the primary use of the facility
- Use of SIC codes to assign Hazard Grades (combustible risk)
- Low Hazard Occupancies (HG 1-3)
 - Offices, Hospitals, Quarry, etc.
- Medium Hazard Occupancies ((HG 4-6)
 - Schools, Hotels, Museums, etc.
- High Hazard Occupancies (HG 7-10)
 - Warehouse, Manufacturing, Pharmaceutical, Mills



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Site Surveys

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Format

- Visits to Individual Locations
 - ERC led
 - (Re)Insurance engineers may attend
- Frequency of visits
 - Typically 1-4 years, depending on:
 - Historical losses
 - Client needs
 - Degree of change
 - Type/Size/Complexity of facility



Objectives

- Information for Clients
 - Independent assessment of facilities
 - SWOT analysis
 - Give risk improvement advice
- Information for Underwriters
 - Assist underwriting decisions
 - Gain confidence of the markets
 - Compare against similar 'risks' worldwide
 - Demand for accurate, up-to-date info



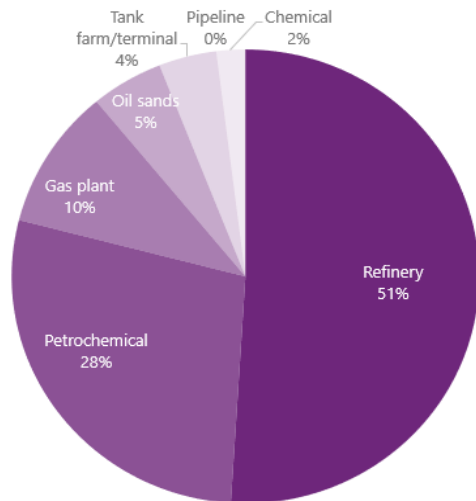
Process

- Use Auditing techniques
 - Procedures
 - Spot checks
- Site tour
 - Close-up view of facilities
 - Check practice versus theory
 - Only a snapshot of current condition
 - Initial feedback at end of survey, full report to follow

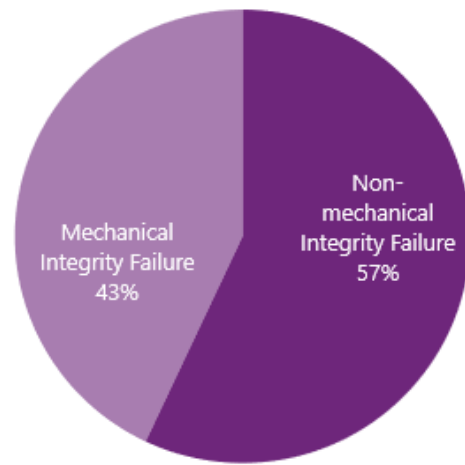


What Causes Losses?

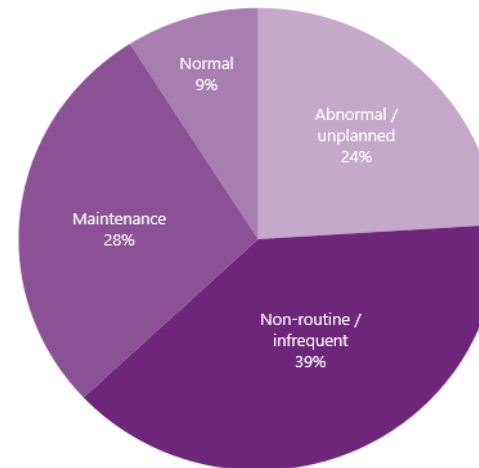
- Data from LMA Publication, 2016 (updated 2020)
 - ***An Analysis of Common Causes of Major Losses in the Onshore Oil, Gas & Petrochemical Industries***
 - 100 Biggest Losses 1995-2019
 - Incurred Losses > USD 50 million



❑ By Industry Type



❑ By Loss Category
43% Losses due to Mech Integrity Failure



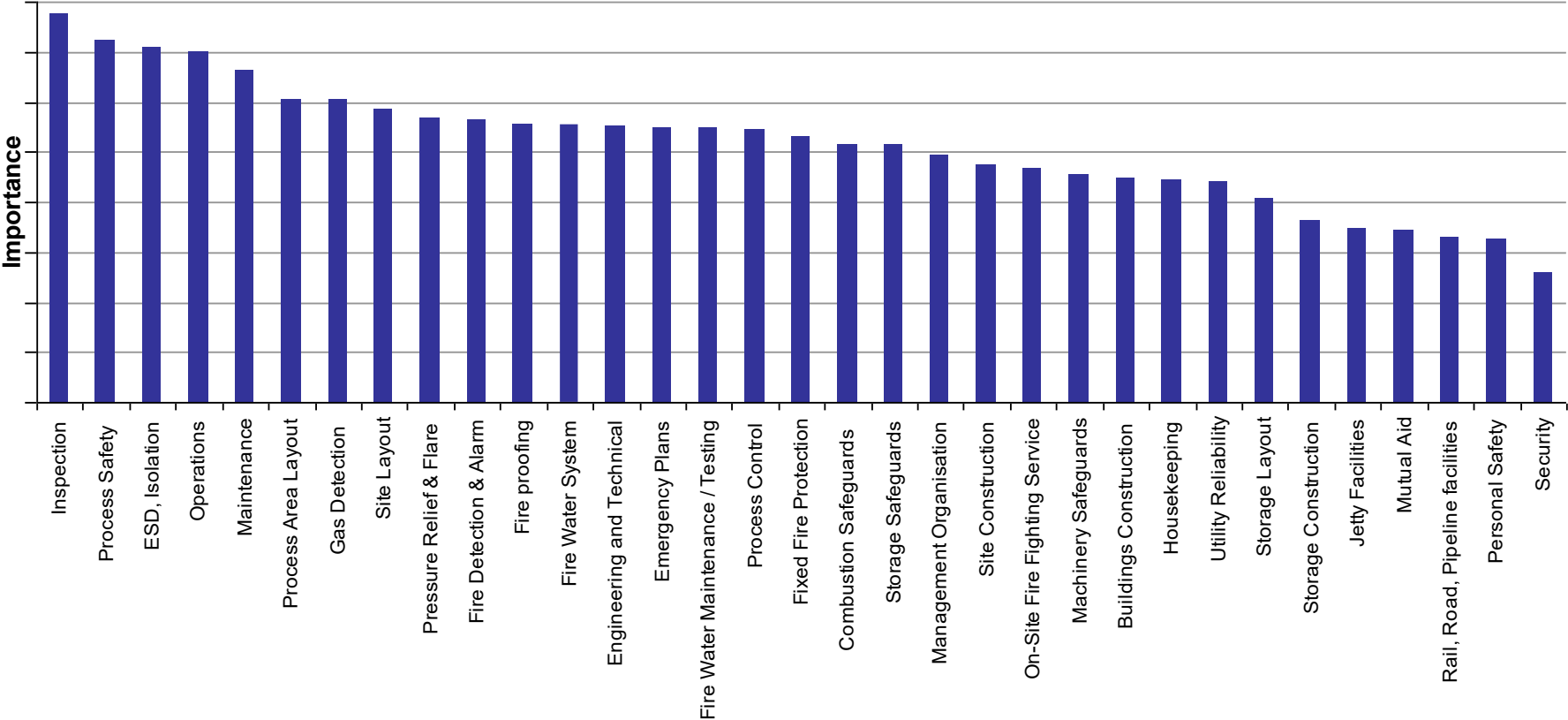
❑ By Operating Mode
Maintenance & Non-Routine Ops are big contributors



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What Causes Losses?

The Insurance Market Priority Order



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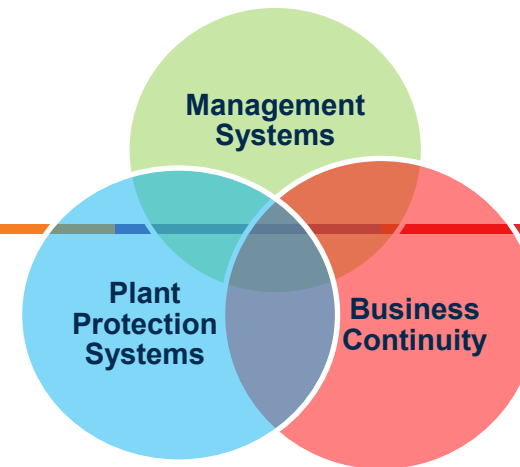
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Risk Engineering Segments



Management Systems

Operations

Maintenance

Inspection

Engineering

Emergency Response

Safety

Protection Systems

Active Process Protection

Active Fire Protection

Passive Fire Protection

Fire & Gas Detection

Business Continuity Planning

BCP 1. Identify Business Risks

- Operational
- Financial
- Suppliers
- Customers
- Environmental

BCP 2. Quantify Risks

- Probability
- Impact

BCP 3

- Preventive Measures
- Contingency Plans
- Implement
- Test & Review

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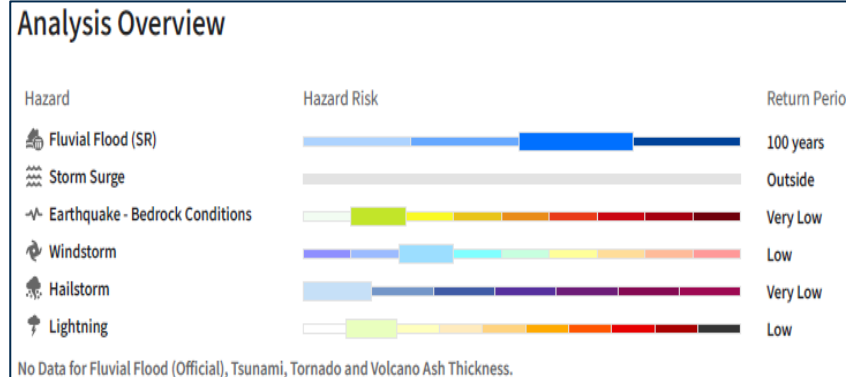
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Exposures

- Internal Exposures
 - Client is tenant in a building
 - Other tenants could be high hazard occupancy
 - No control of building fire protection features
- External Exposures
 - Lack of adequate space separation
 - Occupancy of adjacent structure
 - Wall openings
 - Lack of fixed fire protection features
- Natural Catastrophe
 - Flood, Earthquake, Windstorm, Hailstorm, Lightning, Wildfire, Snow, etc.



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Potential Loss Estimates

Estimated Maximum Loss (EML) Maximum Amount Subject (MAS)

- Largest **credible** loss that can occur
- Assumes active protection systems are **inoperable**
- Assumes **no** manual firefighting intervention occurs
- Limited by clear **space separation**

Maximum Foreseeable Loss (MFL)

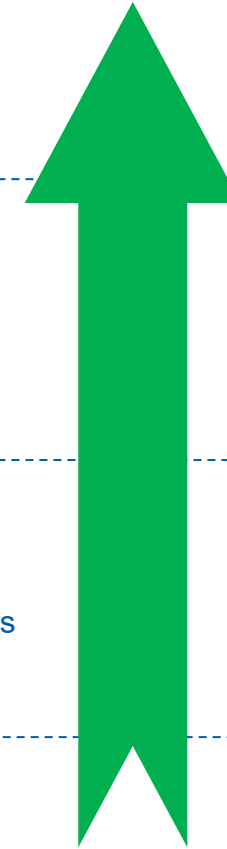
- Largest **credible** loss that can occur
- Assumes active protection systems are **inoperable**
- Assumes **delayed** manual firefighting intervention occurs
- Limited by **clear space separation and fire walls**

Probable Maximum Loss (PML)

- Largest **credible** loss that can occur
- Assumes active protection systems are **impaired**
- Assumes **adequate** manual firefighting intervention occurs
- Limited by **fire walls**

Normal Loss Estimate (NLE)

- Largest **credible** loss that can occur
- Assumes active protection systems are **operable**
- Assumes **adequate** manual firefighting intervention occurs



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Common EML Scenarios

Vapour Cloud Explosion (VCE)

- Source of liquefied flammable gas
- Considers a rupture of pipework or vessel
- Development of vapour cloud
- Ignition source → Explosion
- Refineries, Gas, Petrochemical Plants, Terminals



Pool/Tank/Jet Fires

- Source of liquid/gaseous hydrocarbons
- Considers a rupture of pipework or vessel
- Ignition source → Explosion
- Tank farms, Fuels Terminals



Boiling Liquid Expanding Vapour Explosion (BLEVE)

- Vessel containing pressurised liquid above BP temp
- Uncontrolled increase in pressure
- Liquid hydrocarbon rapidly converts to gas
- Vessel integrity compromised
- Tank farms, Fuel depots, Tanker trucks



High Pressure Vessel Rupture

- Rupture of vessel at high pressure (fatigue failure, maloperation, failure of process control/safety system)
- Ammonia/Fertiliser plants, Batch Chemical plants



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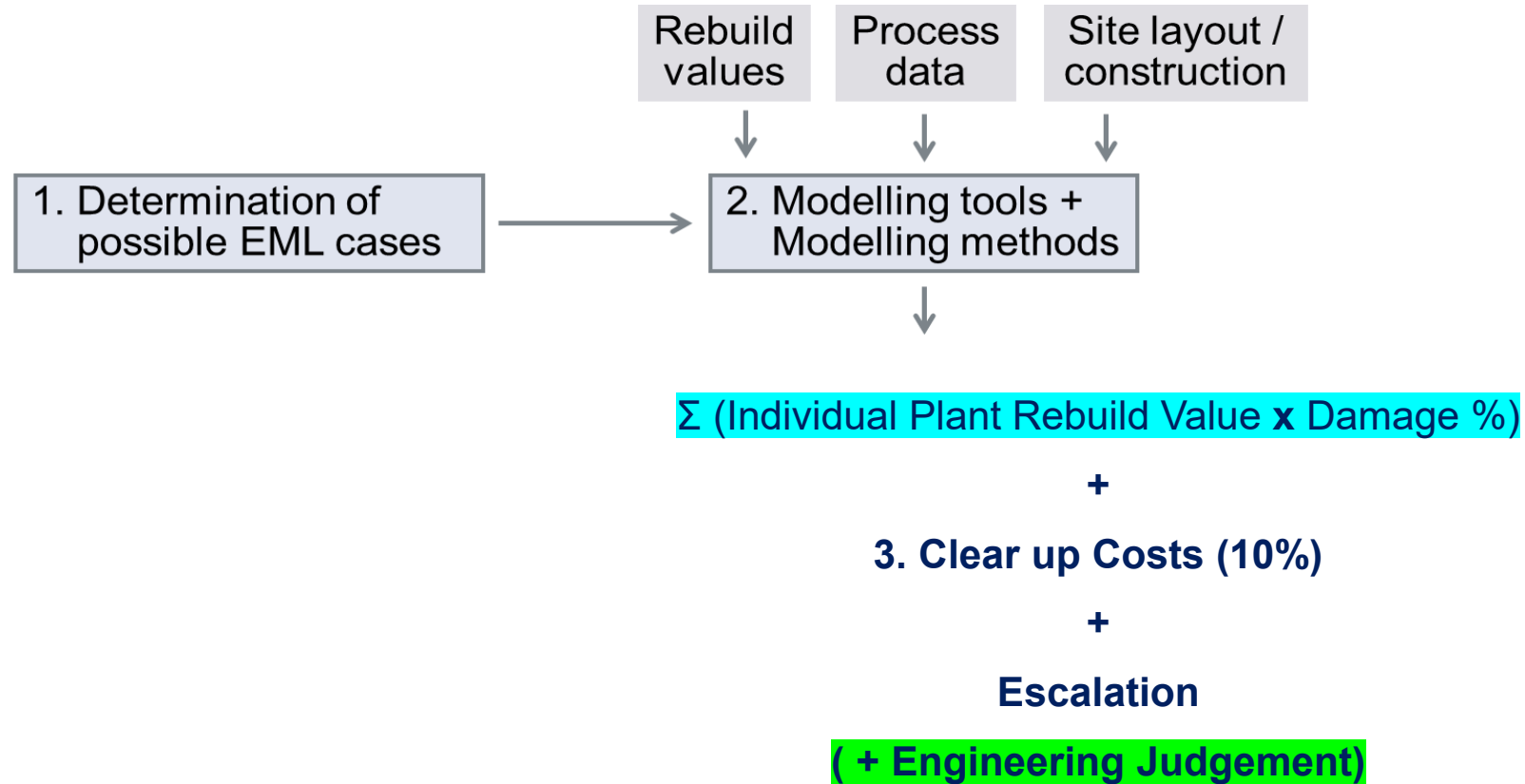
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EML Calculation



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Summary

- ERC core activities
- Value of Risk Engineering and Role of Risk Engineers
- Learning from major incidents
- Risk Management and Principles of Loss Prevention
- Potential Loss Estimation

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Q&A



Thank You

