Hazards29

In association with the Mary Kay O'Connor Process Safety Center

22–24 May 2019, Birmingham, UK

The e-SafetyCase; Electronic or Effortless?

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IChemE
Institution of Chemical Engineers

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What is a Safety Case?

The demonstration that something is safe!

That adequate controls are in place to ensure that the major HSSE risks arising from a particular operation, activity, process etc. are both tolerable and reduced As Low As Reasonably Practicable [ALARP].

A document issued to a regulator to show risks are ALARP to obtain a license to operate?

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Safety Cases – you either love'em or hate'em!

Myth	Reality
✗ Complex and theoretical.	✓ Proportionate to risk.
✗ A thick, weighty document that no one reads!	✓ Fit for purpose, simple, clear and effective. No baggage or precedents! Useful!
✗ Something to tick a box and get a stakeholder off your back and then sits on a shelf gathering dust!	✓ Provides a central focal point to maintain and improve safety throughout the life-cycle of an asset. A live document!
✗ Symptomatic of a legislative regime.	✓ Independent from legislation. Good practice. Shows stakeholders you are managing risk effectively!
✗ Very expensive!	✓ Effective management of risk proven to reduce overall project costs.

The e-SafetyCase OPPORTUNITY

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What is an e-SafetyCase?

Purpose is identical to a traditional Safety Case; demonstrate risks are reduced ALARP.

It is how this information is presented that is key difference.

Instead of being a lengthy, complex written document, the e-SafetyCase is highly interactive and intuitive, using clickable links as a means of connecting and navigating the information quickly and easily.

Accessible and helpful to anyone involved in the safe operation of the facility.

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Case Study – Offshore Wind Farm

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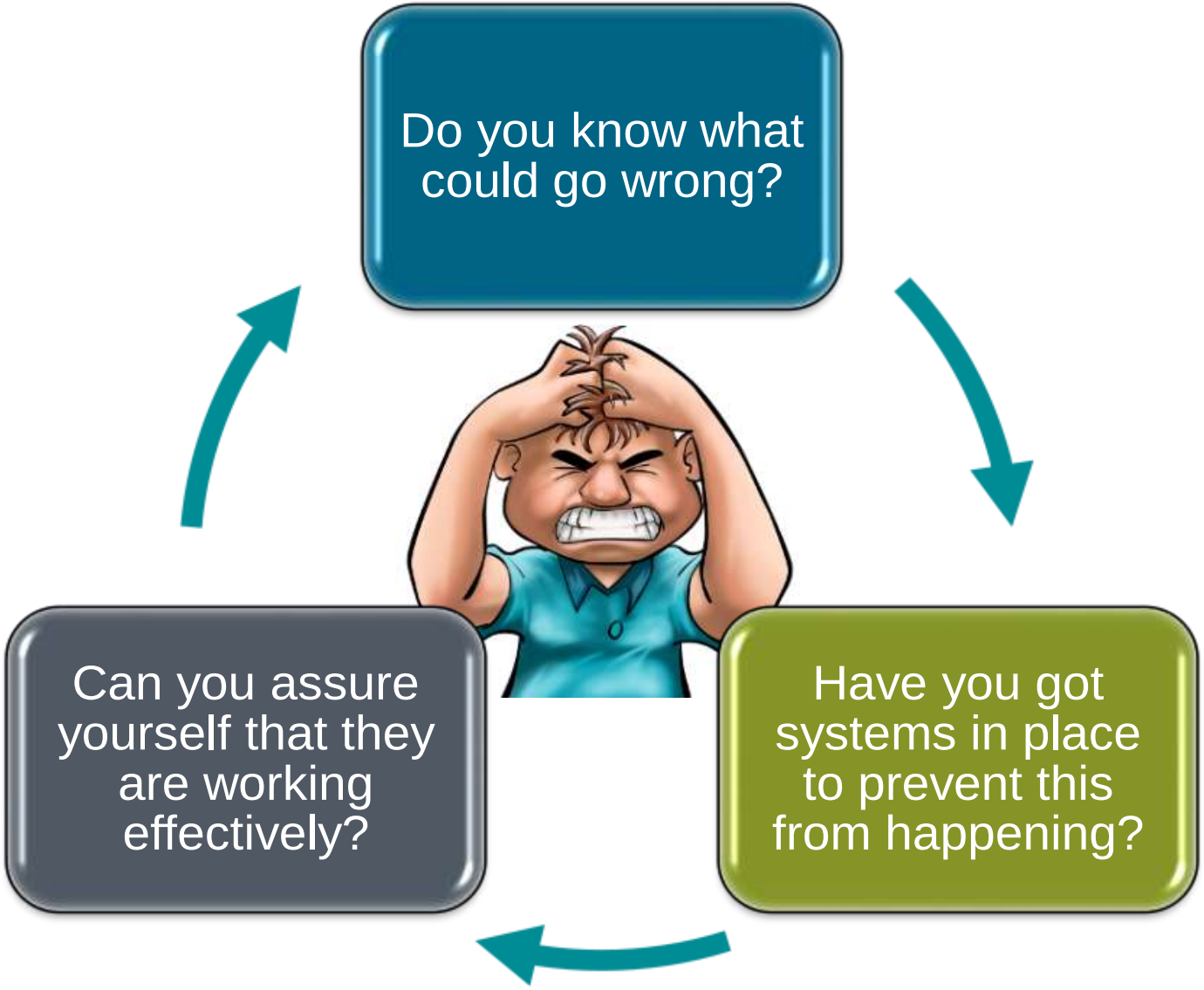
The challenges of effective Risk Management



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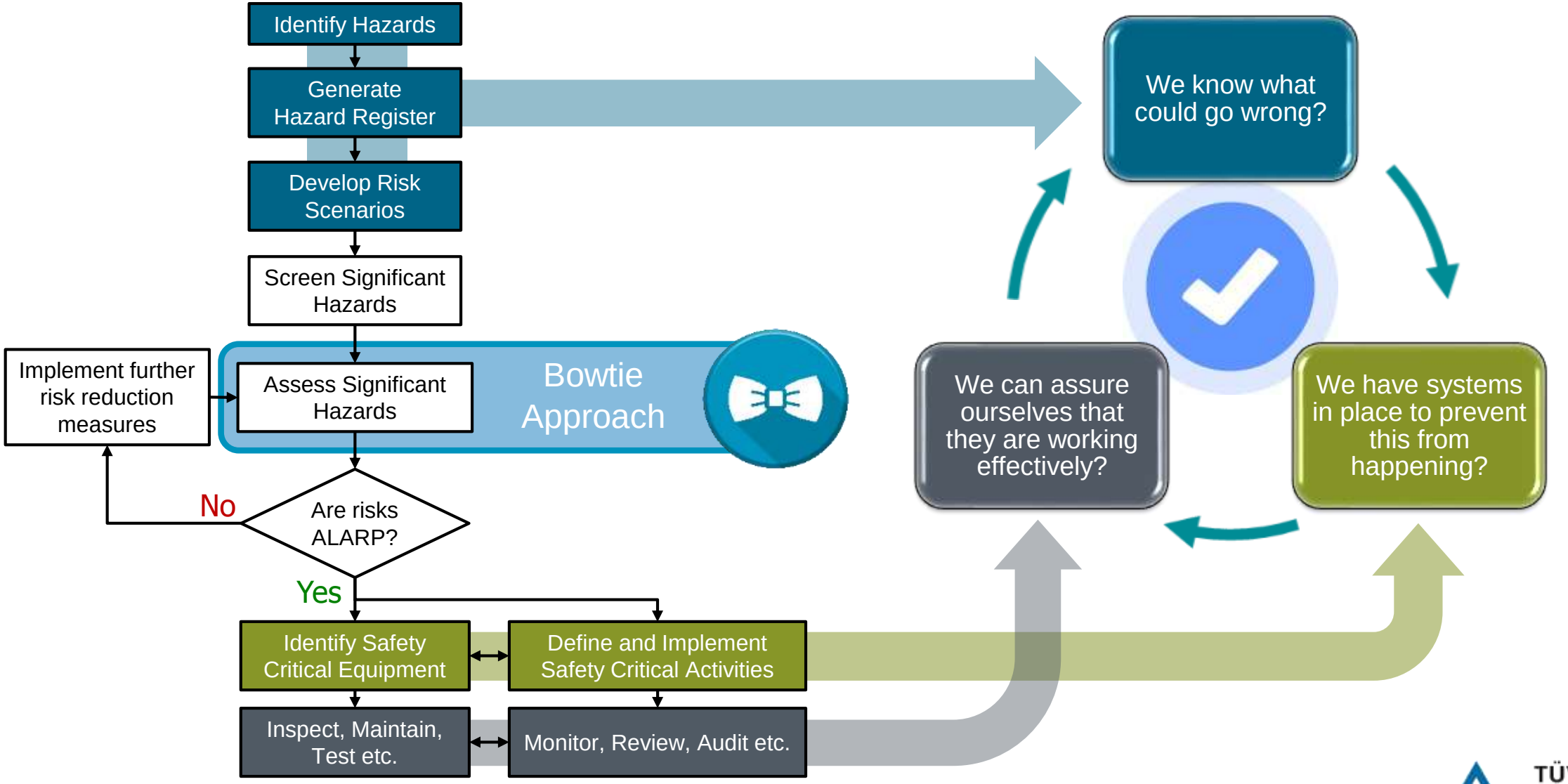
Risk Management Approach



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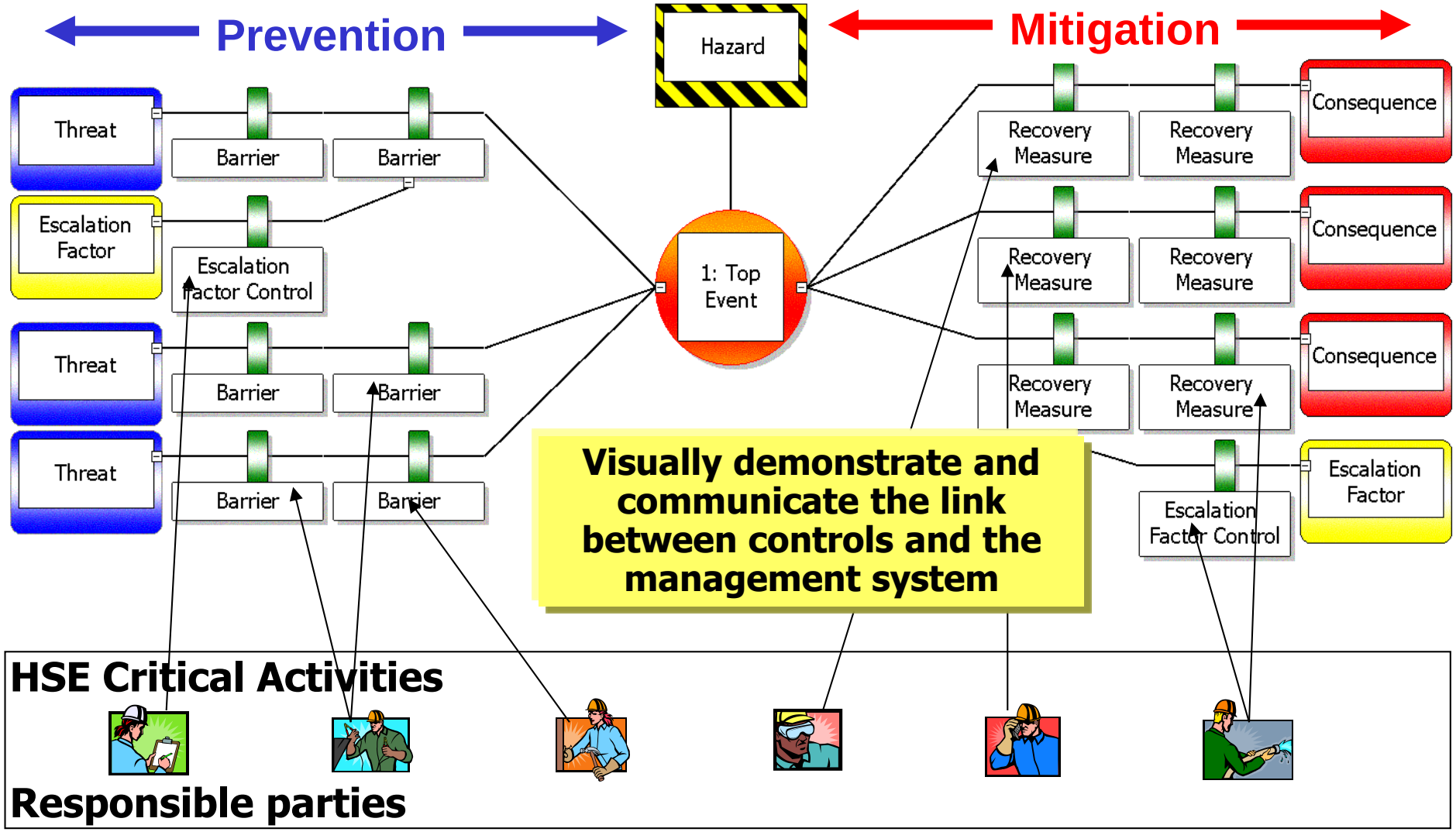
Bowtie Approach



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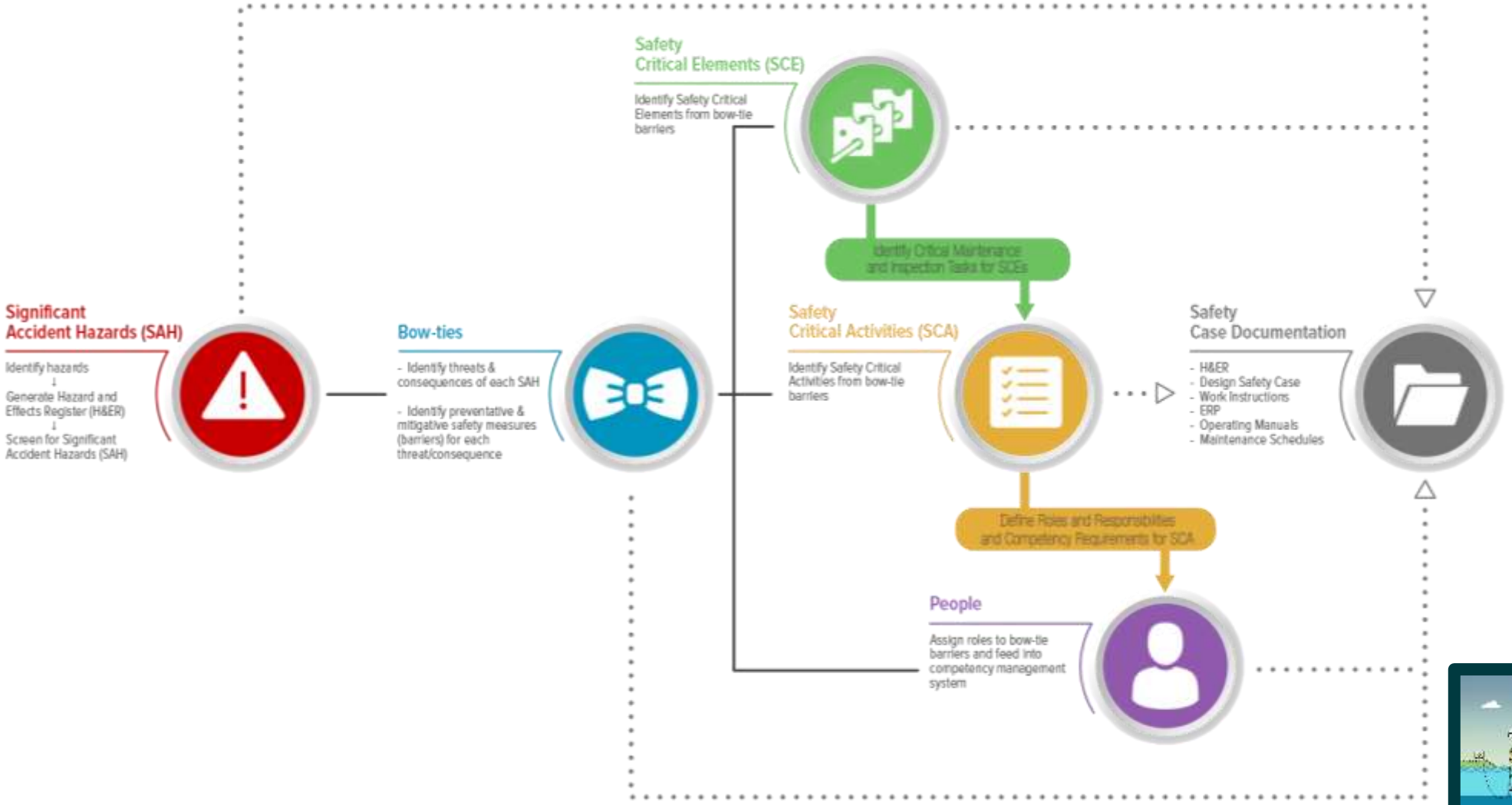
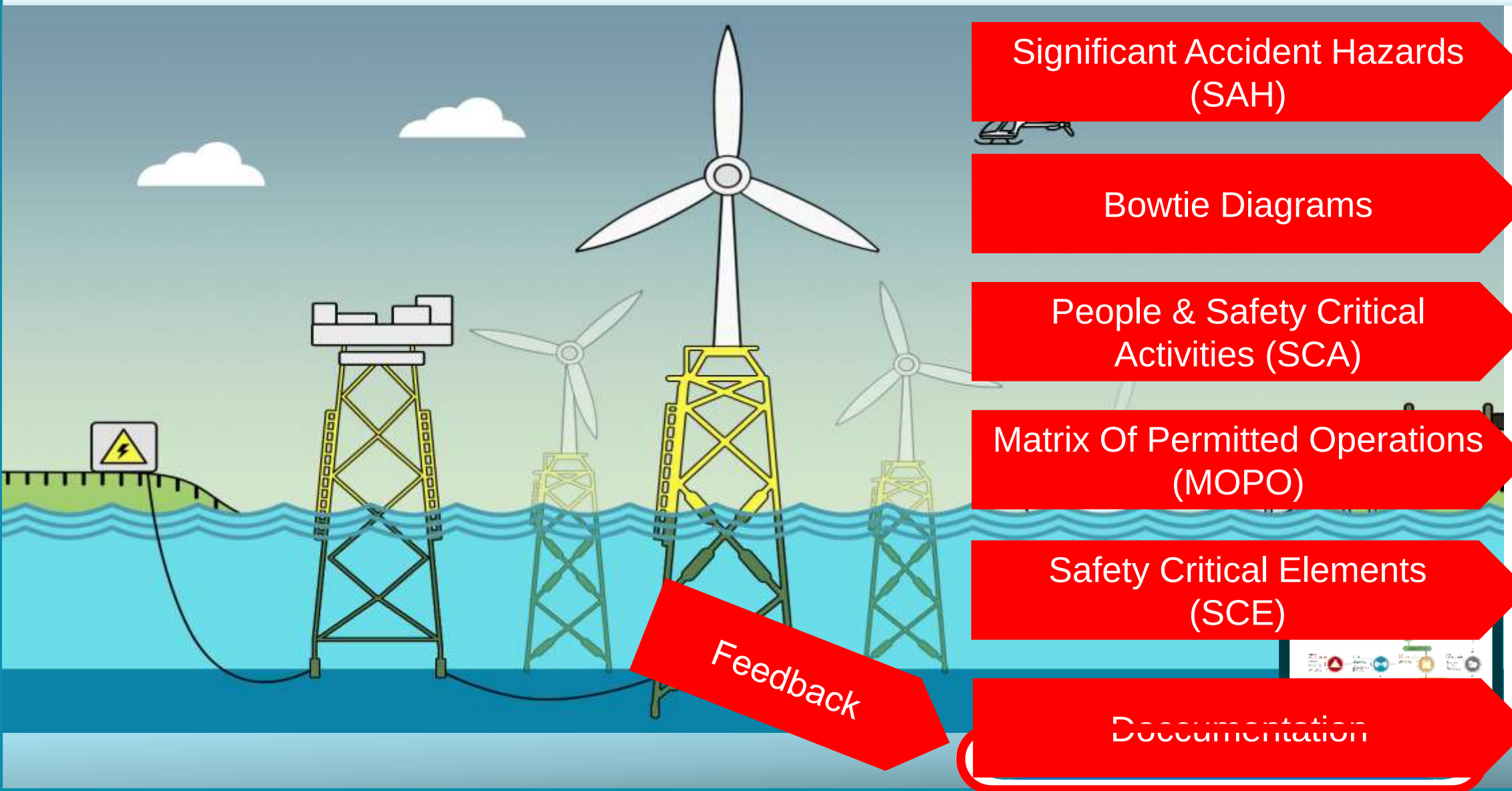
Operations Safety Case



MOPO

Feedback ✉

Operations Safety Case



Significant Accident Hazards (SAH)

Bowtie Diagrams

People & Safety Critical Activities (SCA)

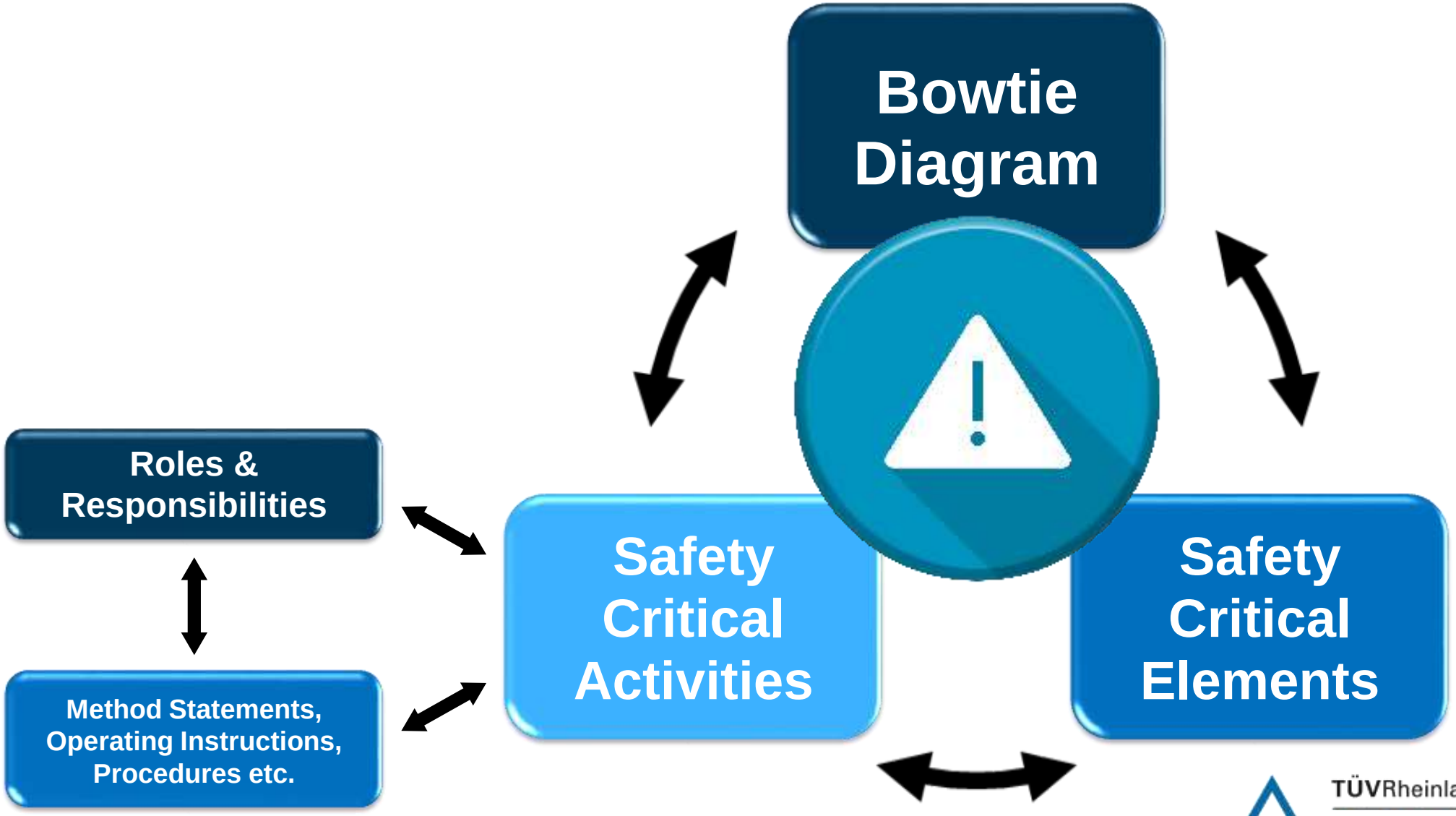
Matrix Of Permitted Operations (MOPO)

Safety Critical Elements (SCE)

Documentation

Feedback

e-SafetyCase Navigation



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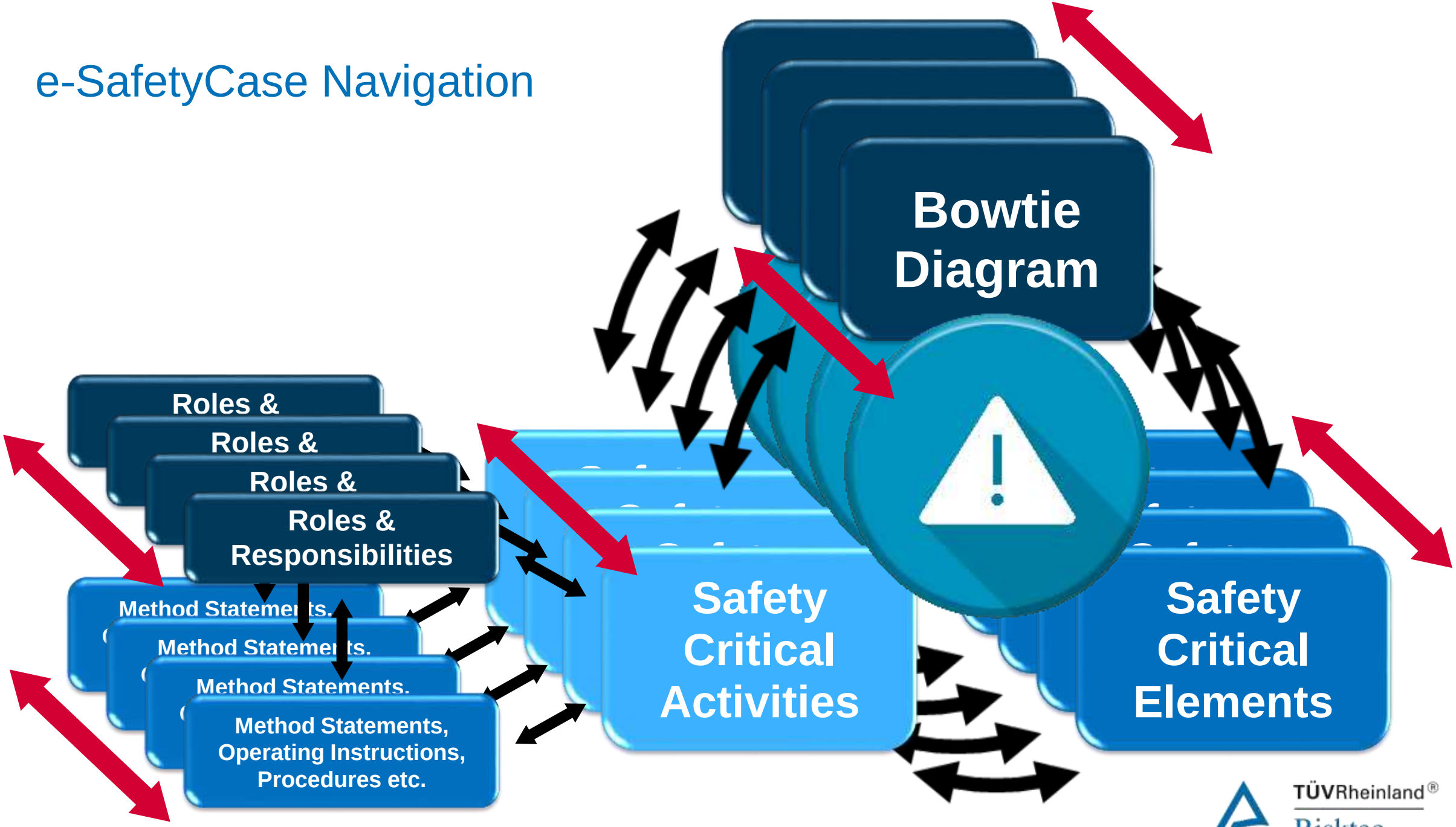
e-SafetyCase Navigation



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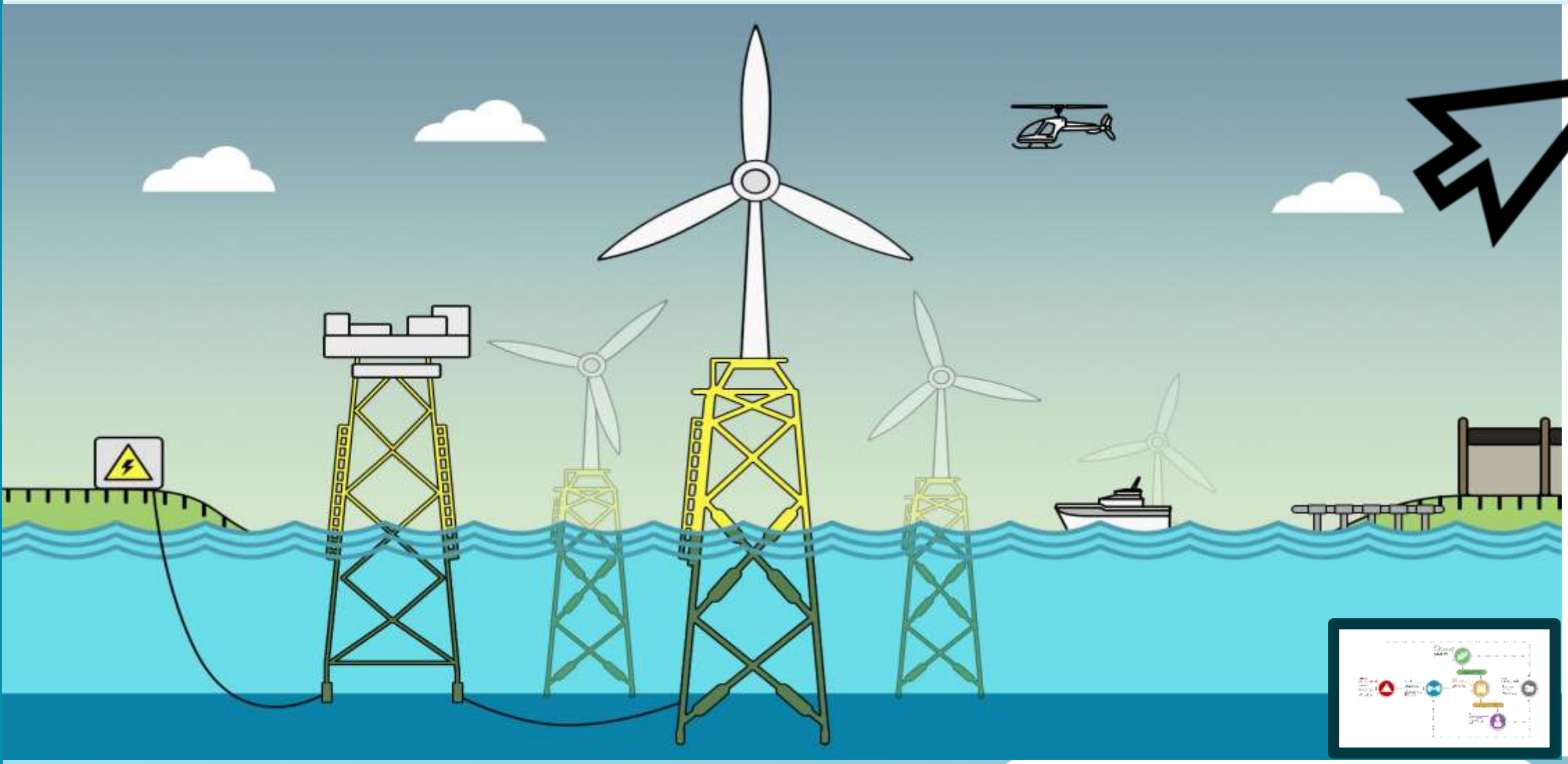
Operations Safety Case



MOPO

Feedback

Significant Accident Hazards (SAH)

Control of Hazardous Energy	SAH-01 Electrical Hazards	SAH-02 Fire Hazards	
		Non-electrical	Electrical
	SAH-06 Hydraulic and Mechanical Systems - Uncontrolled Movement	SAH-07 Hydraulic Systems – Pressure Hazards	
Structural Integrity	SAH-12 Explosion Hazards	SAH-10 Suspended Loads	
	SAH-13 Loss of Structural Integrity		
Occupational Risks	SAH-04 Personnel Transfer	SAH-05 Personnel at Height	
	SAH-08 Vessel Transport	SAH-09 Helicopter Transport	
Emergency Response			

Significant Accident Hazards (SAH)

A Significant Accident Hazard (SAH) is defined as a hazard having the potential to lead to major injuries and/or fatalities. The SAHs for this windfarm were defined during a hazard screening process in the design phase of the project.

This section of the safety case allows you to navigate through the SAH pages.

Click here to open a companion document that describes the process for development of the SAH during the design stages and through to the O&M Phase. This companion document includes:

- A description of the hazard and effects register;
- A description of the process for hazard screening and identification of SAH carried out during the development of the design safety case;
- The process for management of SAH including hazard analyses and bow-tie analysis carried out during the design stages and then operationalised for the Operations Safety Case.

SAH-04 Personnel Transfer Hazards

SAH-04 Personnel Transfer Hazard Summary

The boatlanding [PC003] forms the primary means of access to each WTG and OTM, with heli-hoisting an alternative means of access at the heli-hoisting deck.

Threats which may cause a loss of control during personnel transfer could be vessel movement, human error, poor visibility or extreme weather.

Consequences of such an event could be personnel injury or fatality.

These threats and consequences are presented diagrammatically on the bow-tie diagram on the right (click on image). See here for bow-tie methodology description and here for link to full bow-tie.

Safety Critical Elements and Safety Critical Activities

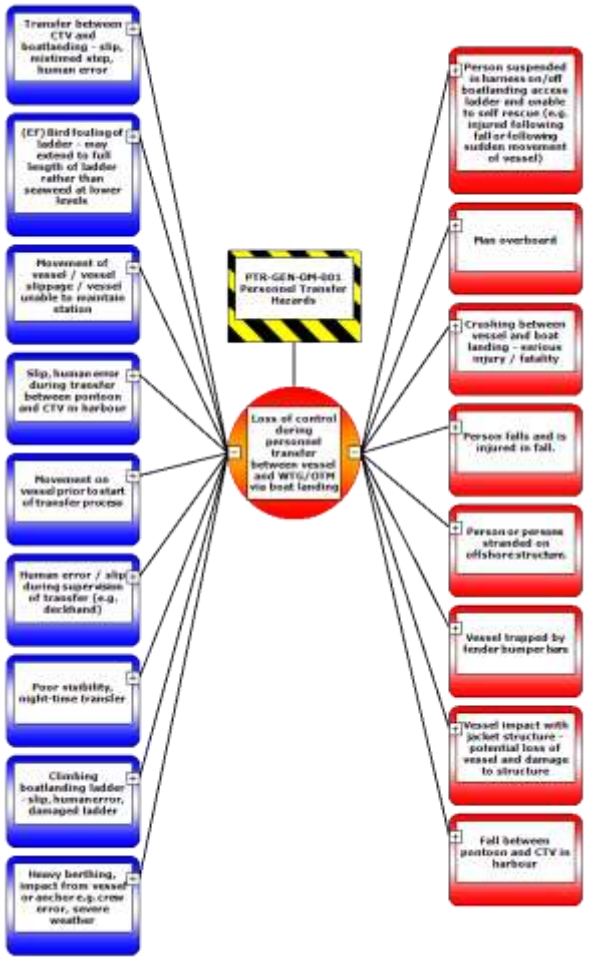
The two buttons on the right provide information on the Safety Critical Elements (SCEs) and Safety Critical Activities (SCAs) associated with SAH-04. These were identified during the bow-tie development process and appear on the relevant preventative and mitigative safety barriers in the bow-ties.

Training: Personnel Transfer

SAH-04 Personnel Transfer Hazards SCEs

SAH-04 Personnel Transfer Activities

Bow-tie Threats and Consequences



Feedback

SAH-04 Personnel Transfer Hazards Activities

SAH-04 Personnel Transfer Activities

Activity Reference	Activity Title
SAFETY CRITICAL ACTIVITIES	
SCA-02	Marine Coordination
SCA-03	Provision of suitable offshore PPE and enforcement of PPE regime
SCA-10	Vessel Emergency Response
SCE ASSURANCE TASKS	
SCE-SI002	WTG Sub-Structure
SCE-PC001	CTV
SCE-PC003	Boatlanding
SCE-LS001	Fall Arrest Systems
SAFETY IMPORTANT ACTIVITIES	
SIA-01	Competency Management
SIA-02	Safety culture and leadership
SIA-03	Vessel housekeeping
SIA-06	Management of change procedures

The high level activities presented in the table on the left were identified from the bow-ties and support the safety barriers in place against loss of control during personnel transfer.

Click on an activity reference to see details of that activity and to view the sub-tasks for those activities.

See here for Safety Critical Activities (SCA) description and links to all SCAs.

See here for Safety Important Activities (SIA) description and links to all SCAs.

For details of specific Safety Assurance Tasks, see corresponding Safety Critical Element.

SCA-03 Provision of suitable offshore PPE and enforcement of PPE regime

SCA-03 Provision of suitable offshore PPE and enforcement of PPE regime

Activity Ref.	Description of Activity	Responsibility	Bow-tie	Document	Verification
SCA-03.01	Put on immersion suit in suitable areas and ensure that it is worn while transferring	/ SS Technician			
SCA-03.02	Ensure that policy and practice is implemented such that personnel do not climb if FAS is out of service	CTV Skipper			
SCA-03.03	Ensure personnel using rope access equipment which has been certified and is inspected regularly	OPS MGR			
SCA-03.04	Carry out buddy check of PPE when changing over from access/climbing PPE to working PPE in the WTG. Check must be carried out prior to resuming working at height	/ SS Technician			
SCA-03.05	Ensure that personnel wear safety harness attached to SRL FAS, and appropriate PPE including survival suit, life jacket and hard hat at all times when transferring	/ SS Technician	PTR-GEN-OM-001		
SCA-03.06	Ensure that personnel work in restraint if covers are removed and fall hazards exist	OPS MGR and SS OPS MGR			
SCA-03.07	Maintenance and inspection of PPE to ensure it is in good condition	OPS MGR and SS OPS MGR			
SCA-03.08	Personnel to carry life jacket and immersion suit up to nacelle from T-piece on arrival at site	/ SS Technician	EER-GEN-GN-001		
SCA-03.09	Ensure footwear in good condition and free from oil / grease contamination	/ SS Technician	HGT-WTG-OM-001		
SCA-03.10	Ensure all personnel with access to WTG tower are equipped with PPE including full body harness, and work positioning belts and lanyards, which can be used to enable the climber to rest at any point on the ladder.	SS OPS MGR	HGT-WTG-OM-001		
SCA-03.11	Ensure provision of lifejacket providing at least 275 N of buoyancy	OPS MGR and SS OPS MGR			
SCA-03.12	Ensure provision of immersion suit and policy for wearing immersion suit is developed and enforced	OPS MGR and SS OPS MGR			
SCA-03.13	Ensure that personnel wear lifevests with reflective tape, whistles, and personal locator beacon (when working outside or during an emergency)	OPS MGR and SS OPS MGR	EER-GEN-GN-001		

Feedback

Service Technician (Tech)

Service Technician (Tech)

SAFETY CRITICAL ACTIVITIES	
Activity Ref.	**Activity Title**
SCA-01	Personnel Transfer Procedure
SCA-03	Provision of suitable offshore PPE and enforcement of PPE regime
SCA-04	Work on WTG SSOW
SCA-05	Rope Access Work SSoW
SCA-06	Work inside Blade SSOW
SCA-07	Permit to Work system
SCA-08	Management of WTG / OTM Inventory
SCA-13	Work on OTM SSoW
SCA-14	Safe System of Work for Lifting Operations
SCA-15	Safe System of Work for Electrical Work
SCA-16	Helicopter Operations SSOW
SCA-17	Safe System of Work for Use of Hydraulic Tools (Owned)

SCE ASSURANCE TASKS	
Activity Ref.	**Activity Title**
SCE-SI003	WTG Structure
SCE-PC004	Nacelle Heli-hoist Deck
SCE-PC007	WTG Tower Lift
SCE-PC011	Blade (Internal)
SCE-HC001	Hydraulic System
SCE-HC002	WTG Transformers
SCE-HC004	Service Lifting Equipment
SCE-HC012	LV Supply System
SCE-HC014	Electrical Cabinets / Containers
SCE-DS004	Fire/smoke Detection Systems
SCE-PS003	Lightning Protection System
SCE-SD001	WTG Shutdown
SCE-ER001	Escape & Evacuation Routes
SCE-LS001	Fall Arrest Systems

SAFETY IMPORTANT ACTIVITIES	
Activity Ref.	**Activity Title**
SIA-04	WTG housekeeping

Insert high level role description

This section allows you to navigate through the different responsibilities identified from the bow-ties associated with the role of Service Technician.

The tables on the left provides a summary list of high level activities, these include;

- Safety Critical Activities – *activities which are critical to ensuring safety and continued integrity of design*
- SCE Assurance Tasks – *these tasks assure the Safety Critical Elements continue to function as intended*
- Safety Important Activities - *are not safety critical but are responsible for supporting safety critical activities*

For each high level activity there are sub-tasks. Open this document to see all sub-tasks for which the Service Technician is responsible.
The 'activity reference' links in the tables to the left navigate to detailed activity pages which also provide links to bow-ties where they appear and documentation which support the activities and tasks.

Feedback

People (Roles & Responsibilities)

- Site Operations Manager (OPS MGR)
- Service Operations Manager (Serv OPS MGR)
- Marine Controller (MCO)
- Electrical Switching Supervisor (ESS)
- Control Room Shift Supervisor/Emergency Controller (CRSS/EC)
- Maintenance Technician (MT)
- Service Technician (S Tech)
- Control Room Operator (CRO)
- Service Manager (SERV MGR) / Technical Support (STS)
- - Service Asset Engineers (SAE)
  - Emergency Command Team (ECT) / Duty Officer (DO)
  - Boat Leaders (BL)

People (Roles and Responsibilities)

This section of the safety case allows you to navigate through the different roles and responsibilities identified from the bow-ties produced for the O&M Phase of the Offshore Windfarm.

The People pages of this safety case contain information regarding the following:

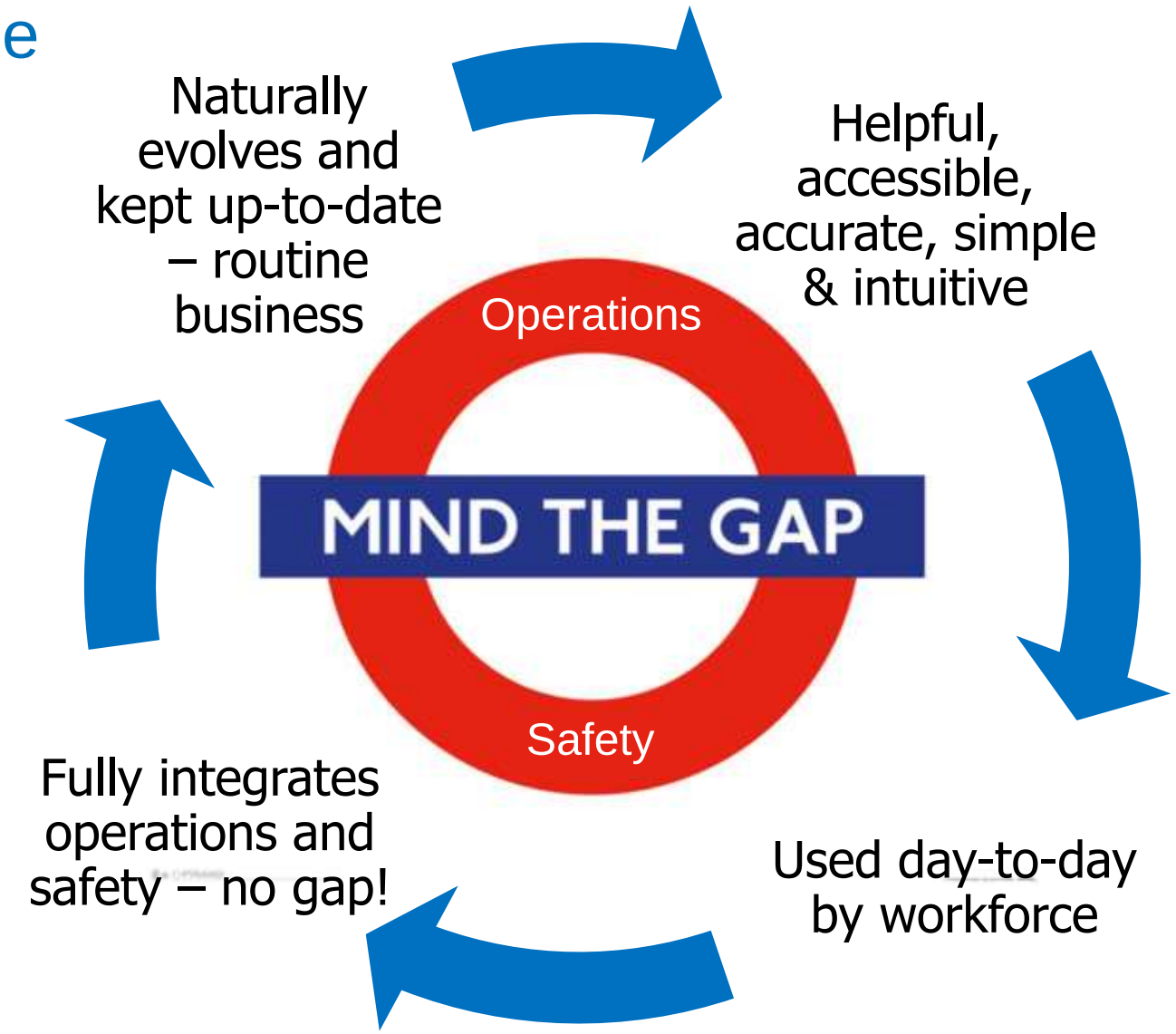
- Activities that each role is responsible for implementing;
  - Safety Critical Activities (SCA) – *activities which are critical to ensuring safety and continued integrity of design*
  - SCE Assurance Tasks (SCE) – *these tasks assure the Safety Critical Elements continue to function as intended*
  - Safety Important Activities (SIA) - *are not safety critical but are responsible for supporting safety critical activities*
- Links to the bow-ties from where the roles and responsibilities were identified;
- Competency requirements for each role.

The roles and responsibilities for third party personnel can be found using the button below.

Third Party Roles and Responsibilities

Benefits of an e-SafetyCase

- Accessible
- Engaging
- Intuitive
- Useful
- Relevant
- Used
- Up-to-date



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Summary of benefits of an e-SafetyCase

1. Provides an accessible, engaging and intuitive basis of safety which proactively drives and encourages safe operations.
2. Naturally evolves hand-in-hand with the facility as routine business.
3. Provides a seamless link between hazards and the actions people need to take to ensure risk is reduced ALARP.

So why aren’t all Safety Cases electronic?

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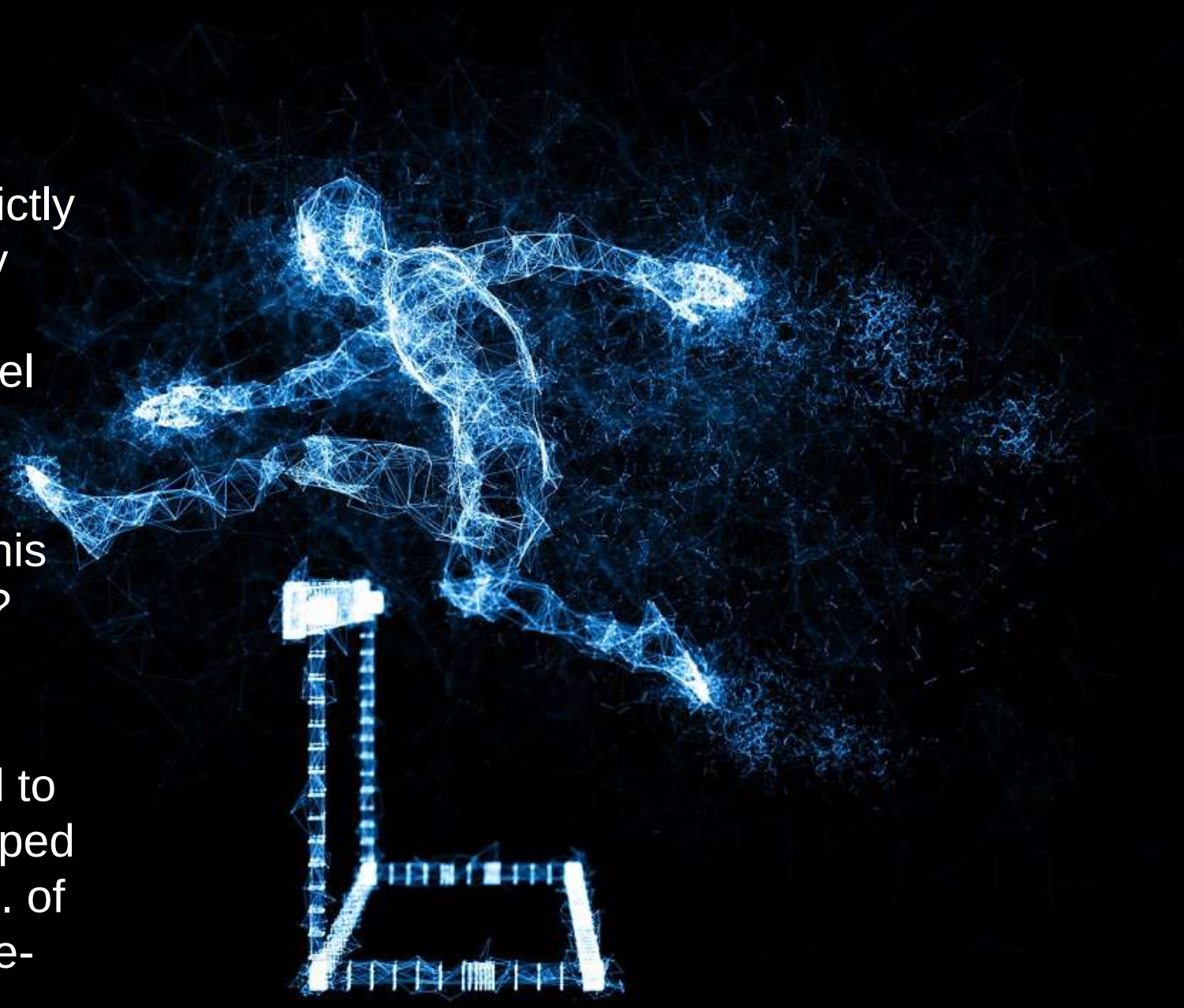
Challenges

1. A regulatory Safety Case is a strictly controlled document and for very good reason. How can an e-SafetyCase deliver the same level of control?
2. A Safety Case includes highly sensitive information. How can this be kept secure in a virtual world?
3. Regulated industries expect a traditional paper-based Safety Case. This is what they are used to and they will invariably have shaped the format, structure, content etc. of these. Will regulators accept an e-SafetyCase?



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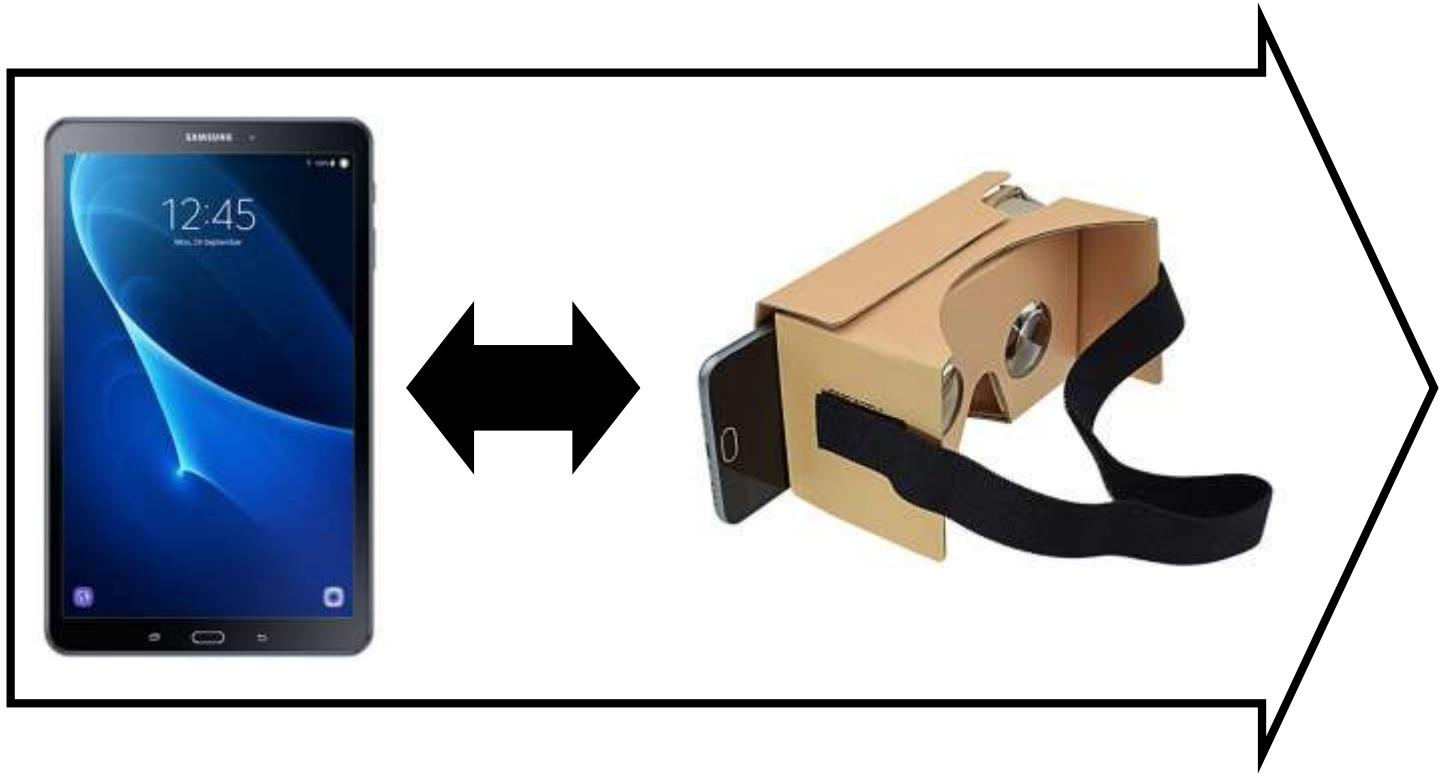
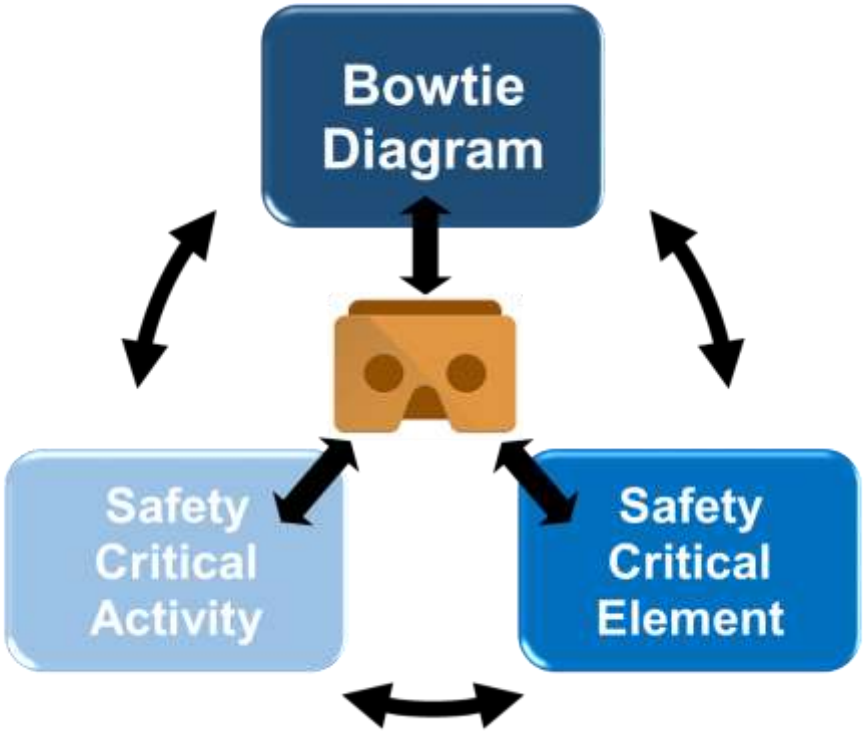
Future Developments – blending VR with e-SafetyCase

Hardware



Functionality



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DIGITAL TWIN

Virtual Reality | Augmented Reality | Tablet Apps

DESIGN

Allows hazard identification to be conducted "within" evolving asset ensuring it is complete and accurate and hence a sound foundation for risk management.

Immerses designers within evolving design ensuring right decisions are taken at right time to reduce through-life risk.

Allows designers to experience ways to optimise accessibility and maintainability to directly reduce risk.

SAFETY CASE

Brings an electronic Safety Case (e-SafetyCase) further to life by allowing viewer to actually experience key elements in real, absolute terms. Direction of travel need not just be one way. A Virtual Twin can provide a highly intuitive and engaging navigational tool for the Safety Case.

Provides 3D model on which consequence modelling can be performed (e.g. fire/explosion modelling). Brings consequence modelling to life further benefitting other areas such as Emergency Response and Incident Investigation.

TRAINING

Allows operators/technicians to practice activities in a highly realistic, zero-risk environment, allowing them to complete their real jobs safely and effectively.

INCIDENT INVESTIGATION

Provides safe environment to re-live incidents to help inform a fully effective incident investigation and help communicate route causes and remedial measures to prevent reoccurrence.

OPERATION & MAINTENANCE

Provides safe environment to develop and optimise through-life modifications such that risks associated with implementation and subsequent operation are reduced to acceptable levels.

Provides safe environment to develop, test and rehearse complex procedures so that actual work can be completed as safely as possible.

Enhances operating procedures by making them more realistic and intuitive minimising risk of human error.

EMERGENCY RESPONSE

Provides safe and realistic environment for operators/technicians to practice emergency response, ensuring they are best prepared to do it for real if an incident arises.

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Conclusions

- An e-SafetyCase is no more onerous to produce and maintain than a conventional Safety Case - it’s just different!
- Could be so useful and effective it will naturally evolve hand-in-hand with the facility as routine business.
- Provides an accessible, engaging and intuitive basis of safety which proactively drives and encourages safe operations.
- Can be blended with technological innovations such as Virtual Reality to further bring it to life.

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Thank you

Have a safe and secure day!

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