

# Risktec Solutions

risk management and assessment for business

Hydrogen Generation on Orkney:  
Integrating Established Risk Management Best  
Practice to Emerging Clean Energy Sector  
21<sup>st</sup> September 2021  
Matt Beeson & Chris Ward

International Conference on Hydrogen Safety (ICHS)

## About Chris Ward



**Chris** manages a portfolio of key projects at the European Marine Energy Centre (EMEC) including the £11m Integrating Tidal Energy into the European Grid (ITEG) project, funded by Interreg NWE. ITEG is developing an integrated solution for tidal energy generation, grid management, and hydrogen production.

Chris has extensive experience in Project Management with a career spanning over twenty years in the Public, Private and Charity sectors across the UK and internationally.

Chris has an affinity for the ocean and is determined to do something about climate change.



*[Chris.Ward@emec.org.uk](mailto:Chris.Ward@emec.org.uk)*



## About *Matt Beeson*



**Matt Beeson** is a Principal Consultant with Risktec. He has ~20 years' experience as a risk management consultant. Around ten of those years include experience in the oil and gas, and process industries. Most recently, Matt has been technically leading a large amount of Risktec work in the Clean Energy industries, which includes Offshore Wind, Geological Carbon Storage, and Hydrogen.

*[Matt.Beeson@Risktec.tuv.com](mailto:Matt.Beeson@Risktec.tuv.com)*

# Contents

- Introduction
- ITEG Project Overview
- EMEC Background
- ITEG Risk Management Processes and Techniques
- Discussion
- Summary

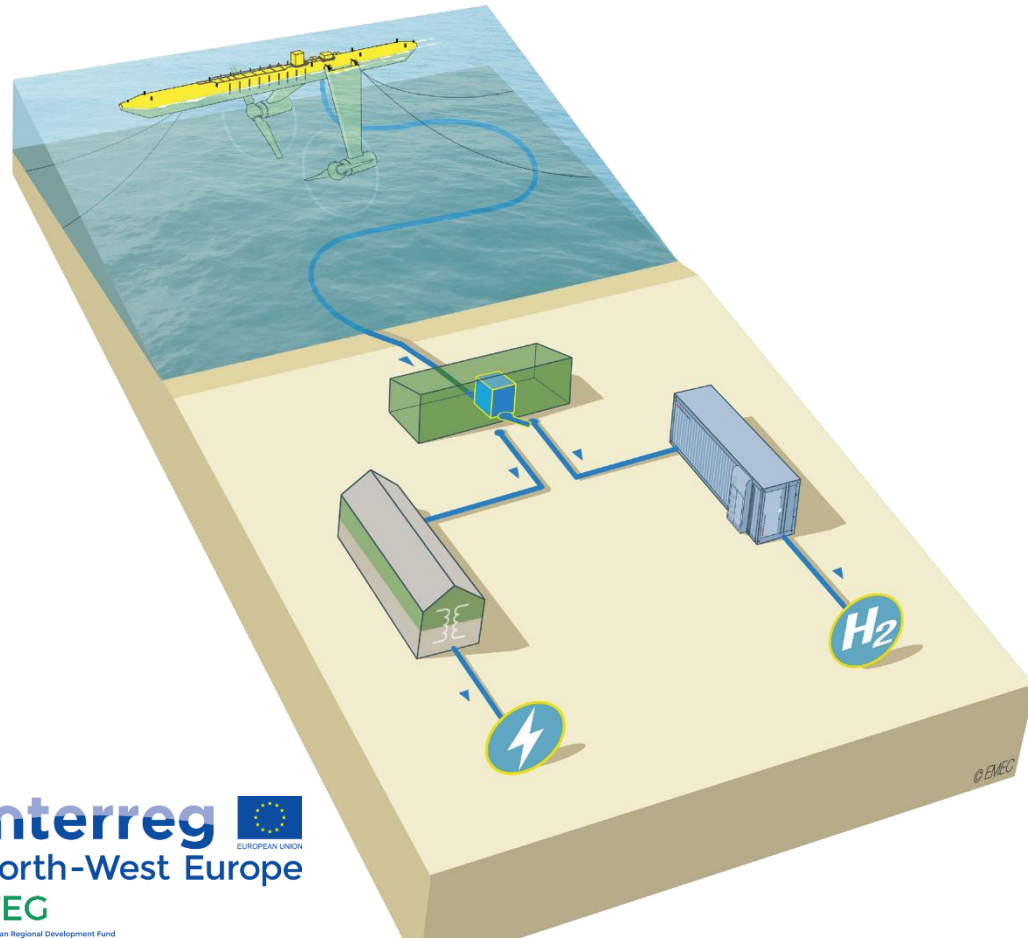
# The ITEG Project

# Introduction

- ITEG (Integrating Tidal Energy into the European Grid) Project
  - A demonstration of clean energy generation and hydrogen production in Orkney
  - Application of good practice safety management
  - Building a model of success and safety for replication globally
- This presentation describes the ITEG project and the application of good practice safety management to green hydrogen production technologies

# ITEG Project Overview

## Project Objectives



- Develop and validate an integrated tidal energy and hydrogen production solution for clean energy generation in remote areas.
- Open new market opportunities for the ocean energy sector through hydrogen production and storage.
- Optimise the EMS and fast-track a clean energy generation, management and storage solution towards commercialisation.
- Build a roadmap to support the replication of the integrated solution in other remote, grid restricted areas.

# ITEG Project Overview

## Project status

- Orbital Marine Power have completed the tidal turbine installation in the Fall of Warness tidal test site.
- EPC contract awarded to local contractor – work underway:
  - Preparing site layout;
  - Detailed hydrogen integration to existing system by Logan Energy;
  - Design validation of the EMS with installation in Summer 2021;
  - Electrolyser delivery and deployment in Summer 2022.





# ITEG Project Overview

## COVID-19 Challenges

- Challenges include:
  - Supply chain issues, resulting in delayed delivery of some project elements;
  - Furloughed staff;
  - Making manufacturing environments COVID-safe for workforce.
- Project extended until December 2022 to allow more operational time of the ITEG solution.
- Remote working utilised to ensure project progression and transparent communication with partners.
- Two project partners withdrawn and one addition
- Remote risk management workshops proved successful with some parties expressing a preference for this approach.

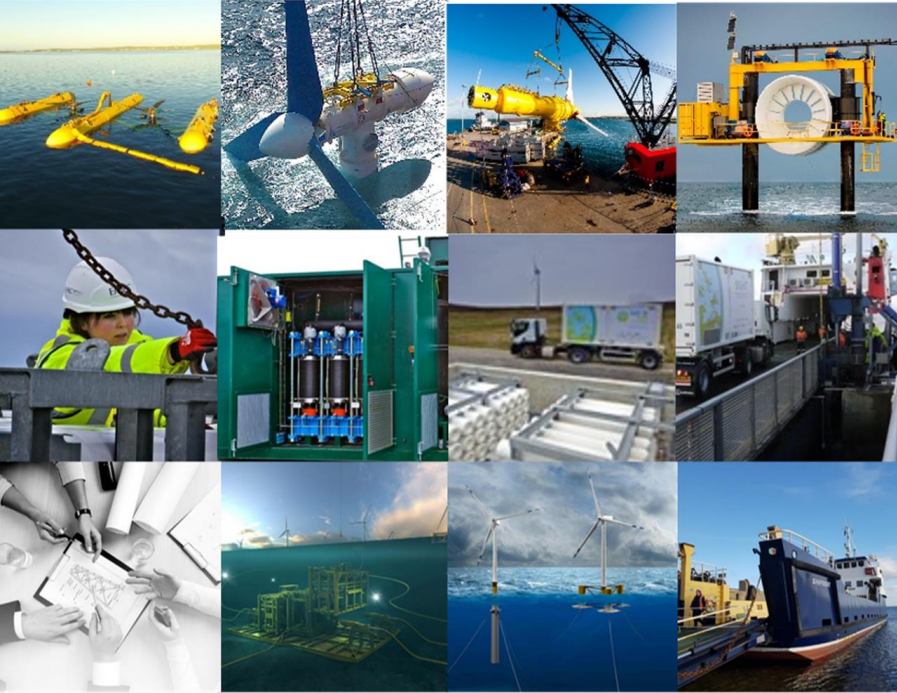
# ITEG Project Overview

## Island Energy System Replication as a Model for Similar Island Economies

- Coastal and island communities living at the end of supply chains have a new economic and security opportunity through green hydrogen, energy system decarbonisation and system integration.
- ITEG tidal to hydrogen production aims to demonstrate a solution for grid export limitations in Orkney that could be replicated in these communities.
- Key learnings gained are being shared in other recently launched replication projects including HEAVENN (The Netherlands), Islander (Germany) and Green Hysland (Spain)



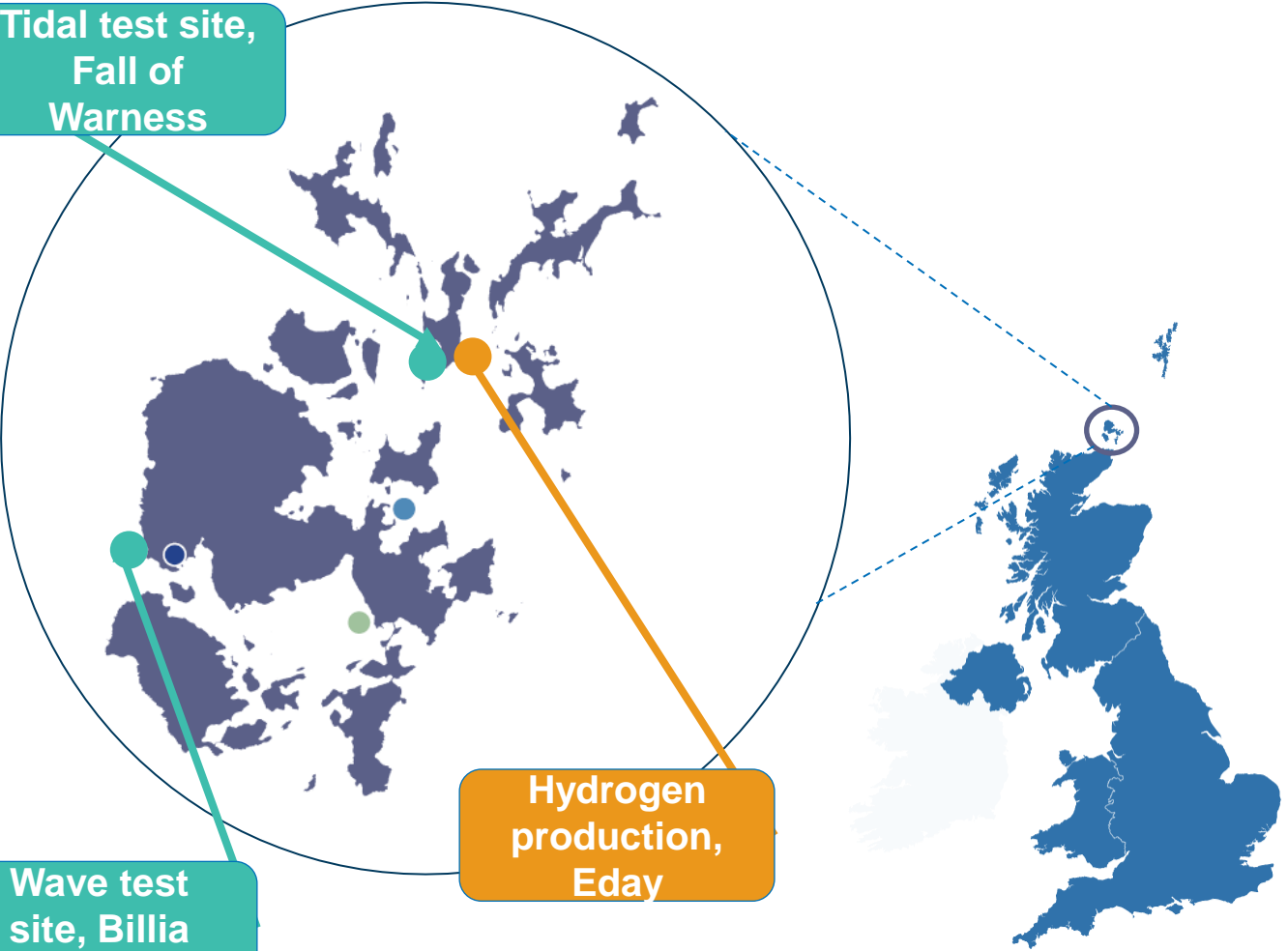
# EMEC Background



Tidal test site,  
Fall of  
Warness

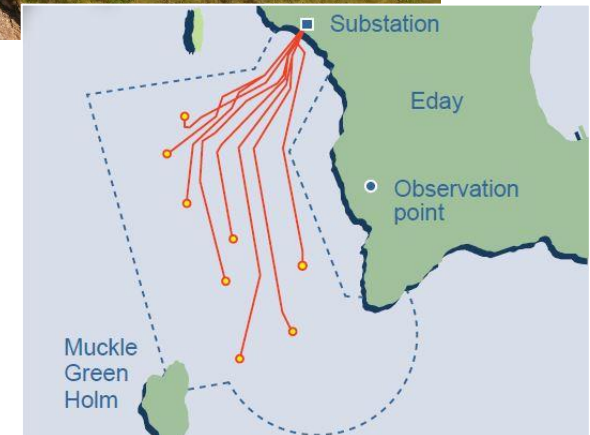
Wave test  
site, Billia  
Croo

Hydrogen  
production,  
Eday



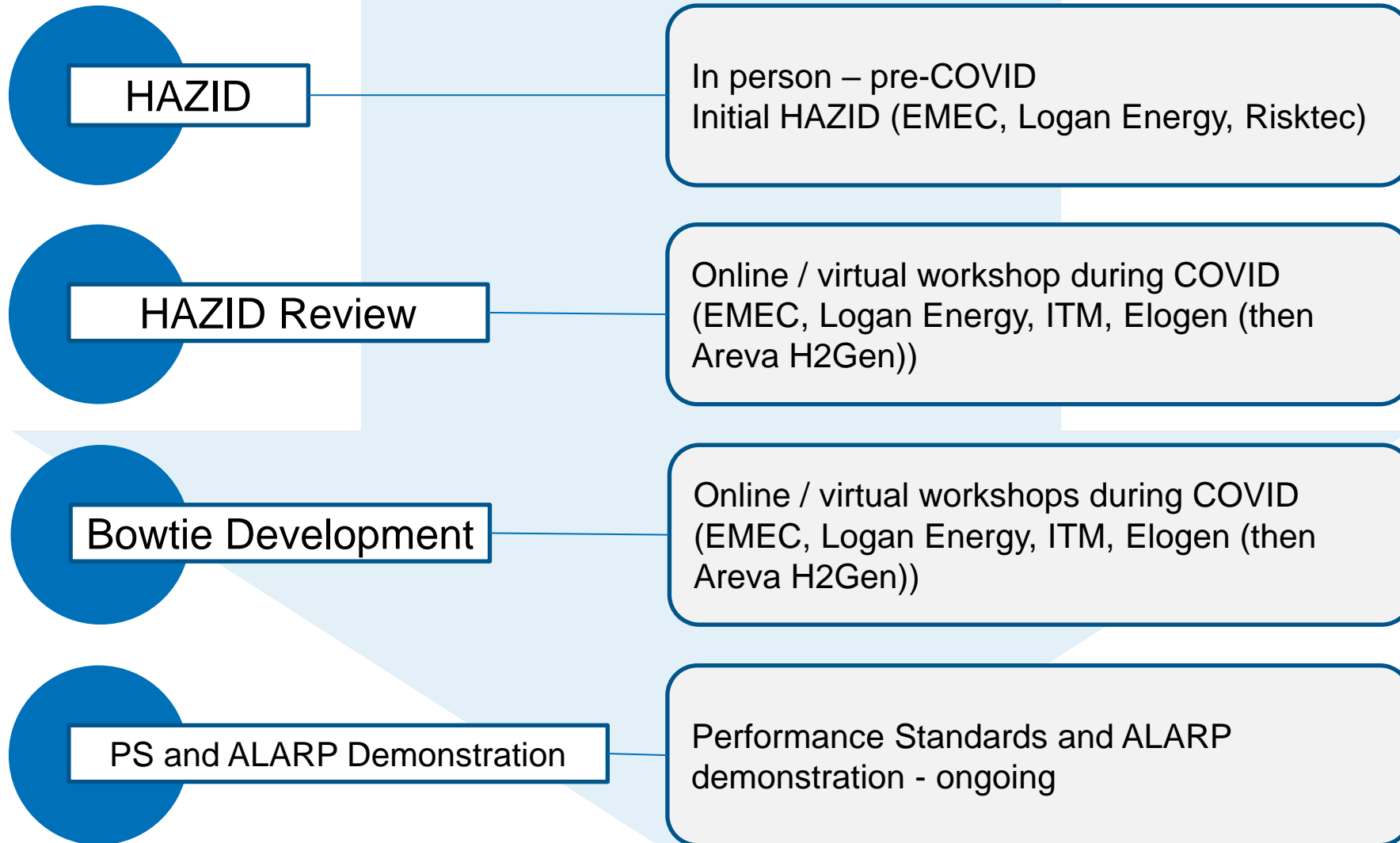
# EMEC Background

- World's leading facility for wave and tidal energy converter testing.
- Offers independent, accredited grid-connected test berths for full-scale prototypes.
- 32 marine energy devices tested in Orkney.
- Expanding into green hydrogen, energy systems and floating wind.
- First site to produce hydrogen through tidal power.
- Committed to supporting the drive to net zero.

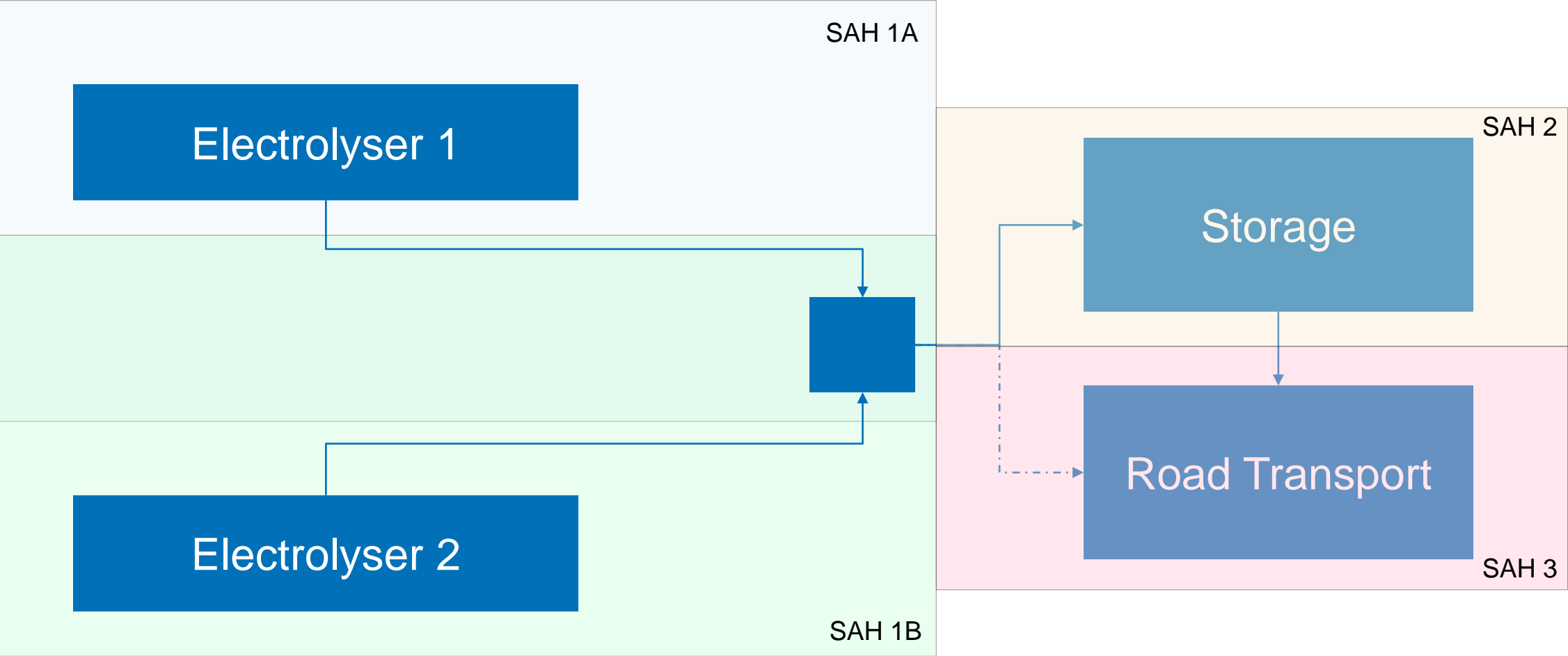


# ITEG Risk Management Processes and Techniques

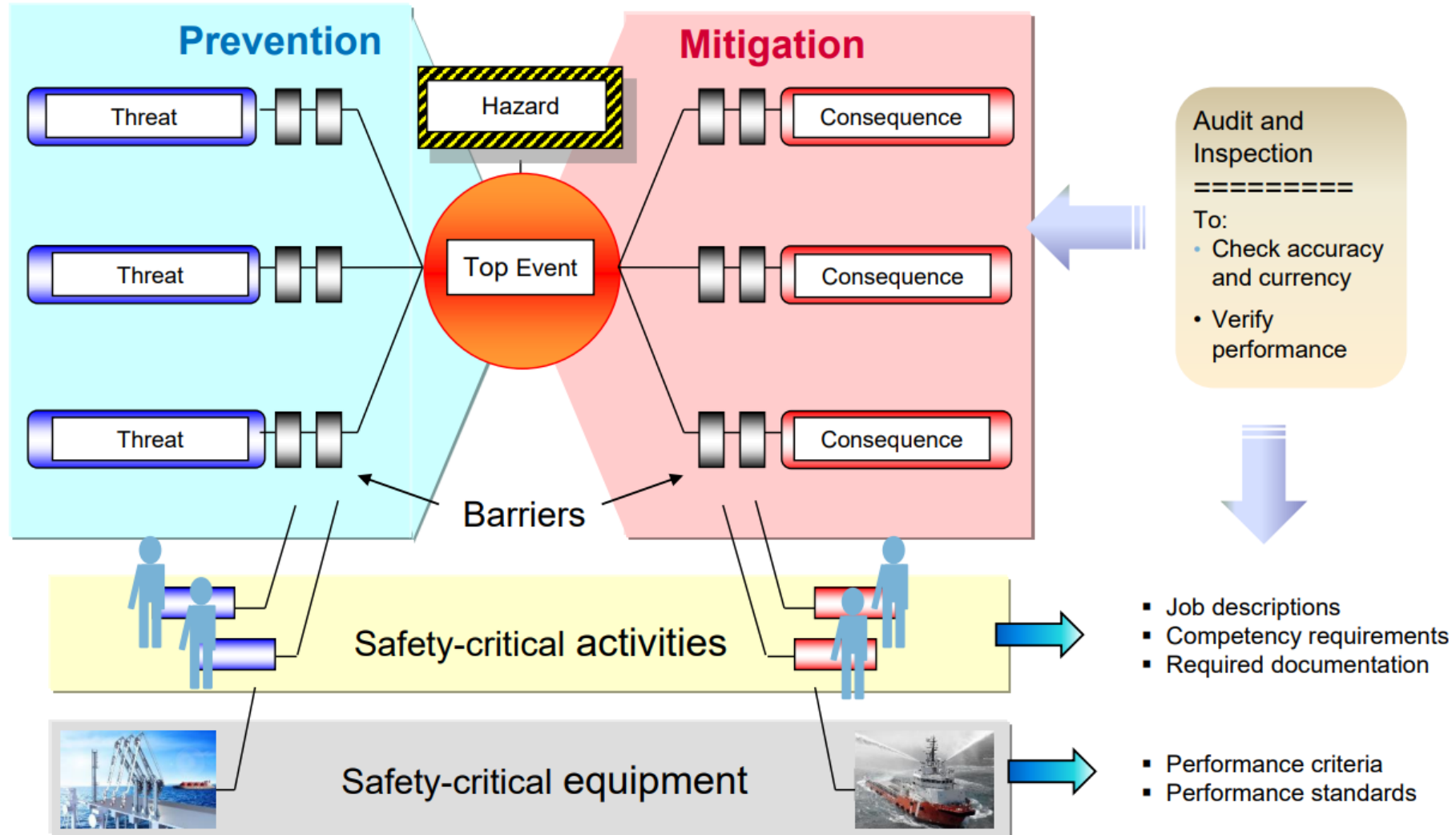
# ITEG Project Risk Management Process



# Significant Accident Hazards (SAH)

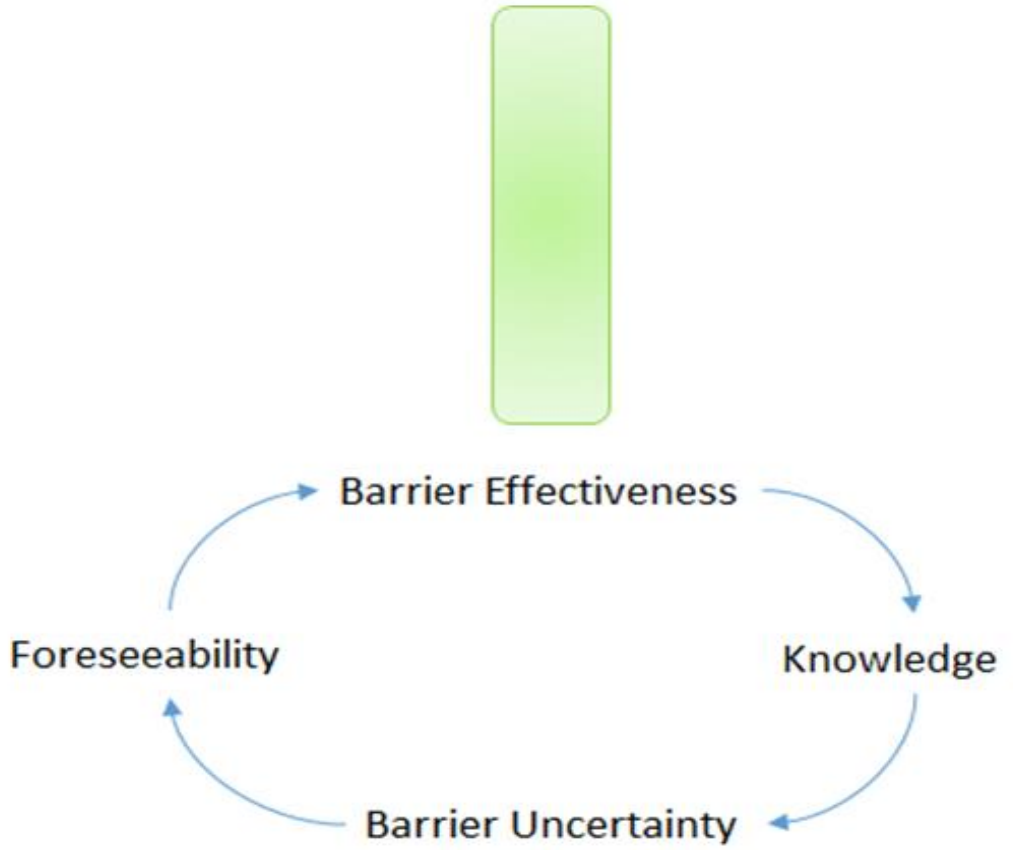
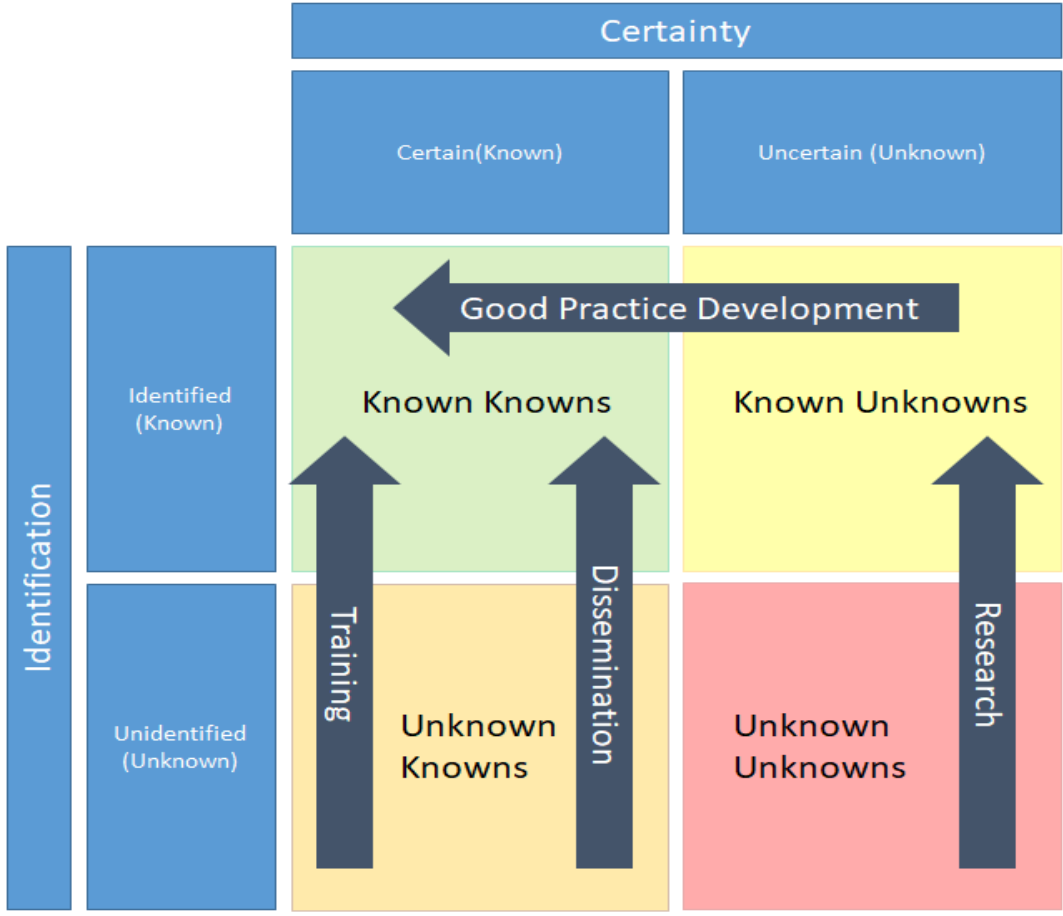


# Bowtie Technique Overview

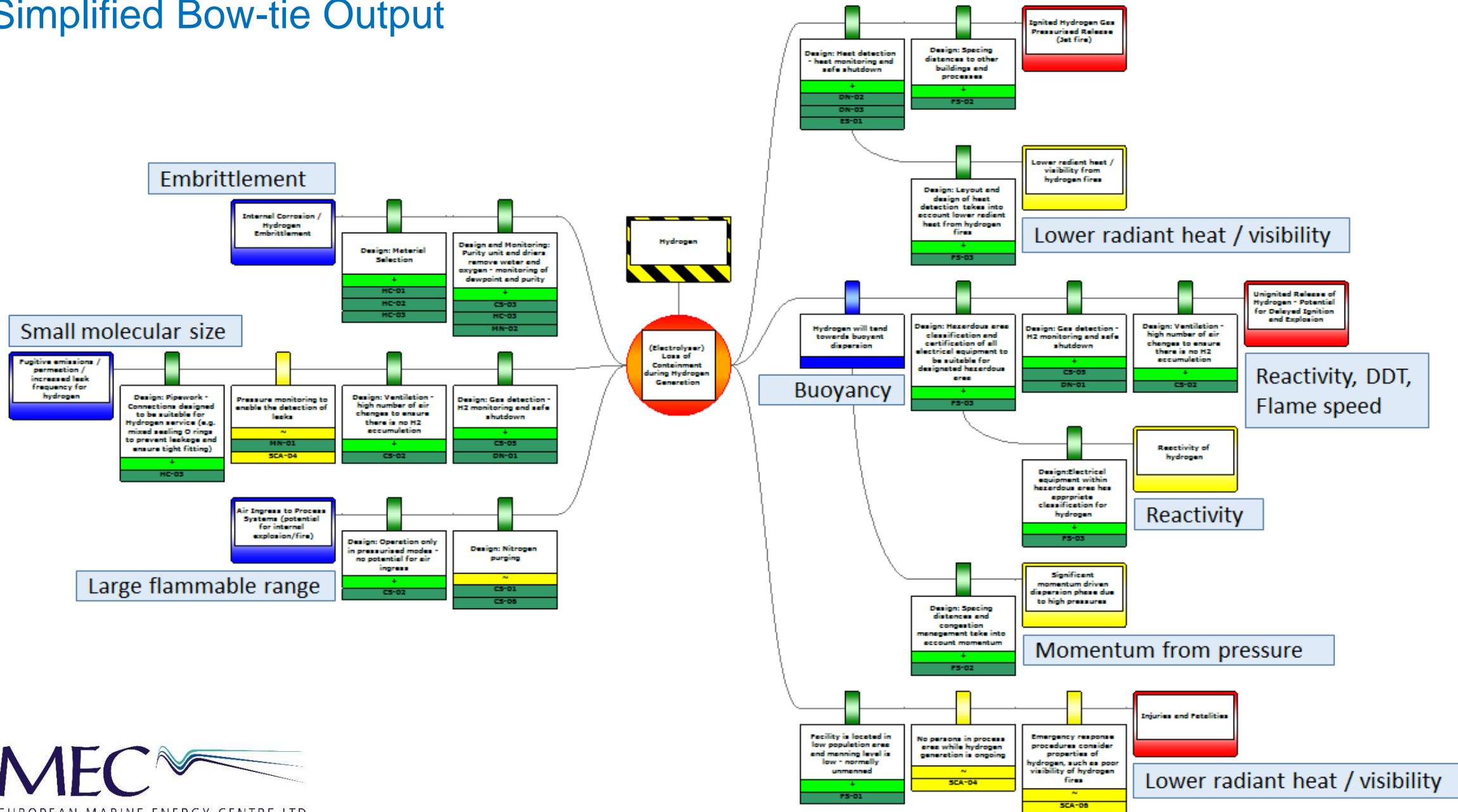




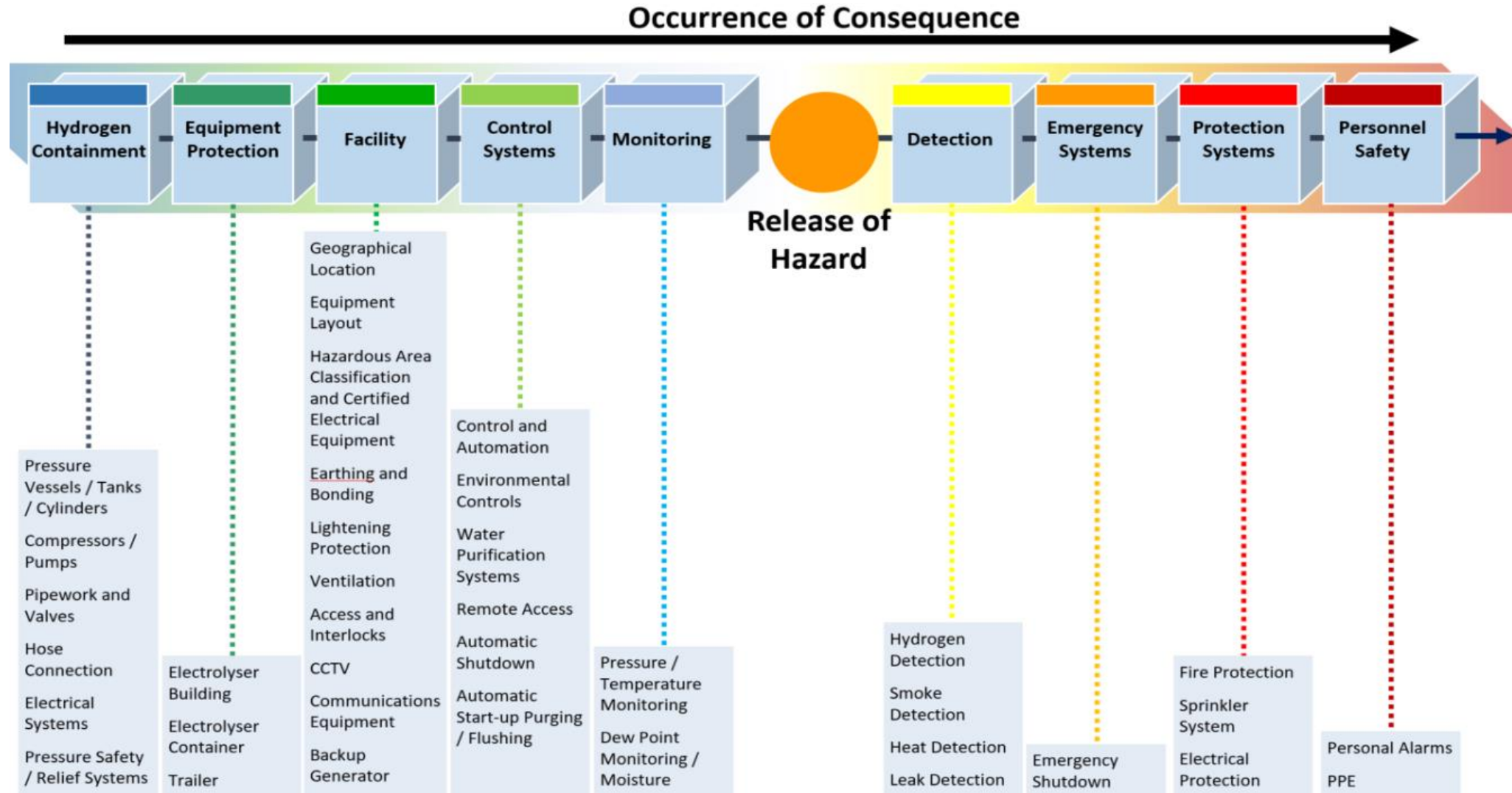
# Bowtie Barrier Effectiveness and Uncertainty



# Simplified Bow-tie Output

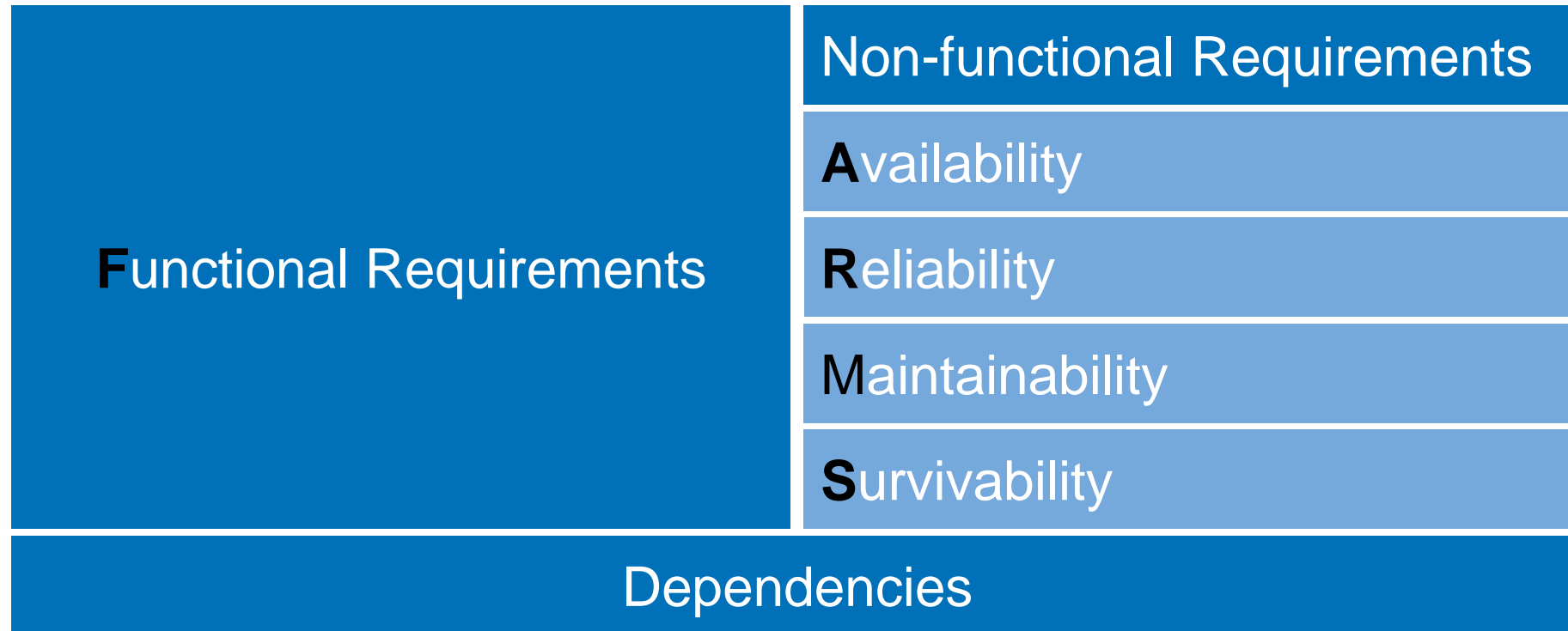


# Safety Critical Element (SCE) Structure

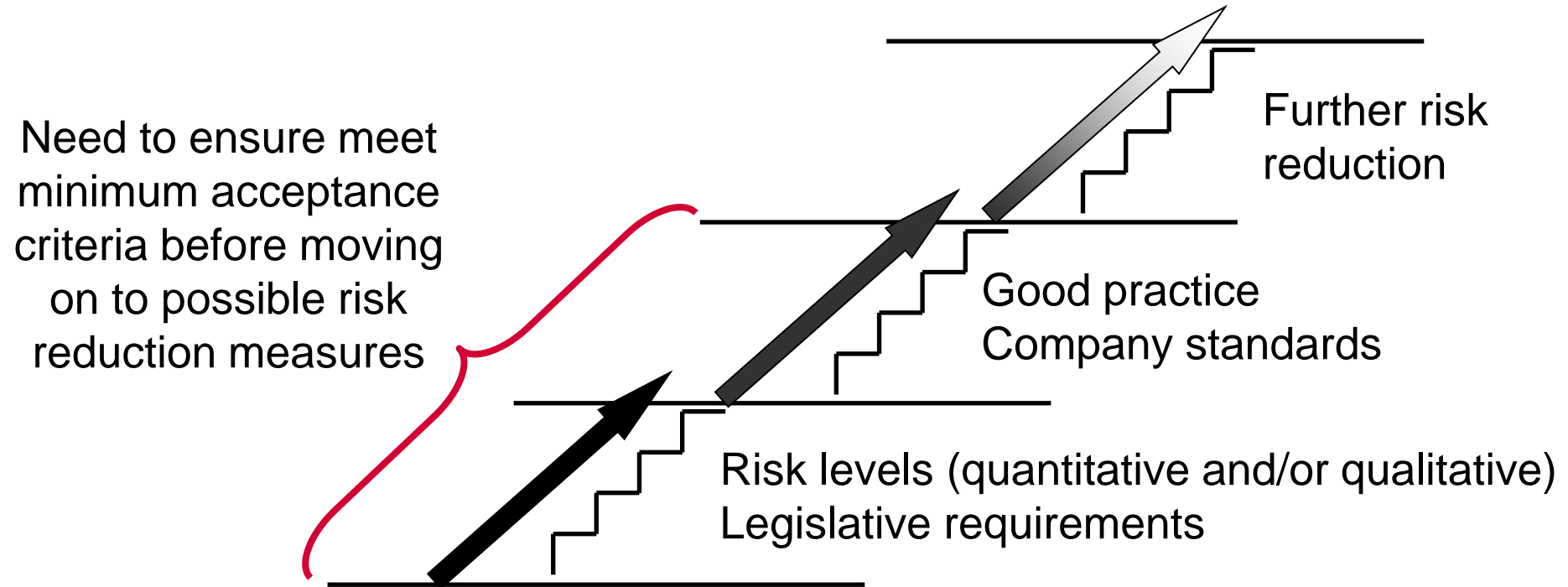


# Safety Critical Element Performance Standards

- Performance standards for each SCE are currently in development.
- Each standard considers FARMS performance as well as dependencies between SCEs



# Demonstration of Risks Reduced As Low As Reasonably Practicable (ALARP)



## Discussion – “Safety as Enabler”

- Proportionality in risk management is always an important concept;
- For green hydrogen proportionality is essential;
- Green hydrogen, produced from surplus renewable energy sources will be an essential part of ensuring that the global community meets carbon emission targets;
- Safety and risk management should be the tool by which the integrity of the industry is preserved and climate targets supported;
- This presentation has described a risk management process that is proportionate:
  - Detailed and focused on hydrogen hazards;
  - Not overly onerous for a small facility with limited hydrogen inventory;
- This process provides a scalable model for other facilities, both technically and from a risk management perspective, particularly those operating in similar island economies.

# Summary

1. ITEG will develop and validate an **integrated tidal energy and hydrogen production solution** for clean energy generation to be demonstrated in Orkney.
2. Risktec, EMEC and the ITEG partners have **implemented a proportionate risk management process** intended to ensure that risks are reduced to acceptable levels and demonstrate that risks have been reduced, while ensuring that the process is not unduly onerous and time consuming.
3. The approach adopted for ITEG aims to demonstrate a solution for grid export limitations faced in remote communities which can be replicated. This approach is innovative both technically and from the perspective of proportionate risk management. **ITEG will therefore serve as a model both for similar island/coastal communities**, and other systems/facilities exploiting the many benefits of green hydrogen.



# Q&A



Thank you for your attention