Mercury Renewables
Major Accident Prevention Policy – Hydrogen Plant

1 Background

Mercury Renewables is seeking planning permission from An Bord Pleanála to construct and operate a green hydrogen production facility (the "Hydrogen Plant") located at Carraun, on the border of Counties Mayo and Sligo. Further detail of the proposed development can be found at firloughwindfarmplanning.com and on the Mercury Renewables website.[1]

The Senior Management of Mercury Renewables has made a commitment to ensuring the achievement of high standards of control of major accidents and hazards, specifically in relation to the operation of Hydrogen Plant. Guaranteeing a high level of protection to human health and the environment. Ongoing review throughout the life of the Hydrogen Plant shall ensure the continuous improvement in the means of prevention and control of major accident hazards.

Members of the Senior Management team have written this policy document and have actively participated in incorporating safety through design from the earliest stages of development of the Hydrogen Plant. This began with the appointment of Black & Veatch as hydrogen technical advisor to Mercury Renewables in large part due to their corporate focus on safety and inclusion of Risktec as a sub-consultant in the Hydrogen Plant design mandate.

Black & Veatch is an employee-owned engineering, procurement, consulting and construction company with a 100-year legacy of innovations in sustainable infrastructure. The company has strong experience in the development of renewable energy and natural gas feedstocks; water treatment for industrial applications; hydrogen generation and purification; hydrogen compression, handling and power generation; and selection of cost-effective storage technology. Their employees bring strategic, regulatory and market experience to evaluate and support the sequenced growth of regional hydrogen economies.

Risktec is an independent and specialist provider of risk management consulting, resourcing, learning and inspection services, and is part of the TÜV Rheinland Group.

Risktec has prepared on behalf of Mercury Renewables a Preliminary Hazard Analysis ("PHA") following several online workshops attended by Mercury Renewables, Black & Veatch and Jennings O'Donovan.

Mercury Renewables has been engaging with the Health and Safety Authority of Ireland ("HSA"), Mayo County Council, Sligo County Council and the Sligo Fire Department throughout development and will continue to engage openly with all relevant health and safety and emergency response authorities throughout the entire life of the project.
In Q1 2023, the HSA published revised Technical Land Use Planning Guidelines updated to include guidance specifically in relation to hydrogen production sites. A

[1] www.mercuryrenewables.ie

Quantitative Risk Assessment has been prepared by Risktec, with input from Black & Veatch and Mercury, and submitted to the HSA as part of the planning application relating specifically to the Hydrogen Plant.

The Hydrogen Plant will be classified a lower-tier COMAH site due to the presence of onsite storage of one single dangerous substance, gaseous hydrogen. Other substances such as glycol, lye and diesel will also be stored onsite but are either not classified as dangerous by the HSA or will be present in amounts small enough not to increase the threshold above the lower-tier COMAH limit. A limited number of 26 hydrogen tube trailers may be stored onsite in allocated storage bays. It will be physically impossible to store more tube trailers given the restricted parking bay space available at the Hydrogen Plant Site. This physical restriction, combined with an operational management control procedure to stop production of hydrogen in the event that maximum onsite storage could reasonably be expected to be reached, will ensure that the Hydrogen Plant will not exceed the lower-tier COMAH threshold.

As the Hydrogen Plant is in the pre-planning stage of development, this MAPP will continue to evolve and be refined as the design of the Hydrogen Plant evolves and through continued and ongoing engagement with key stakeholders such as; the HSA as the Central Competent Authority; the Health Service Executive ("HSE"), An Bord Pleanála, Mayo County Council, Sligo Country Council and the Sligo Fire Department among others.

2 Purpose of MAPP

The overarching aim of this MAPP is to guarantee a high level of protection to human health and the environment at and around the Hydrogen Plant Site by preventing as far as reasonably practicable major accidents. This will be achieved through the following inexhaustive list:

1. Establishment within Mercury Renewables as a safety-first workplace, with safety as the top priority and a safety minded culture.
2. The appointment and continued training and education of appropriately qualified health and safety experts to develop this MAPP, refine and improve it and ensure its implementation in the workplace. This will be achieved top-down with appropriately experienced and qualified personnel appointed at Senior Management level and bottom-up with regular training, auditing and testing of staff, procedures and operational policies.
3. Incorporation of safety by design at the earliest stages of development design
4. Open engagement with relevant authorities from the earliest stages of development, throughout the life of the Hydrogen Plant to ensure appropriate emergency response measures are in place.
5. The establishment and continued refinement of policies and procedures in line with industry regulations as well as national and international best practice to ensure the safe operation of the Hydrogen Plant and preventing so far as is reasonably practicable, the occurrence of major accidents.
6. Frequent internal and independent external review of this MAPP and the detailed policies and procedures arising from it, with the specific focus on identifying changes or adjustment in line with operational.

3 Organisational Structure, People and Training

A Senior Health and Safety Professional ("SHSP") shall be appointed to the senior management team at a suitable time following submission of the planning application to An Bord Pleanála. This individual will have appropriate experience of designing and

managing the safe operation of COMAH / SEVESO sites, ideally with hydrogen as the primary hazardous material. The SHSP will be responsible for establishing a team of internal and external health and safety professionals commensurate with a facility like the Hydrogen Plant. The SHSP shall establish training, design and implementation protocols to ensure all staff, contractors, third party employees onsite are trained to a high level of technical competence.

Prior to the appointment of the SHSP, Mercury Renewables has engaged UK based, International safety consultant, Risktec to support in the early stages of safety assessment. As of the date of this document, Senior Management at Mercury Renewables have prepared this MAPP and will continue to refine the document with support from Risktec prior to the appointment of the SHSP in a position within the Senior Management team of Mercury Renewables.

Senior Management acknowledges the collective responsibility for the implementation of the policies contained herein, as evidenced by the signature from Mercury Renewables' most senior management individual, John Duffy.

3.1 Training Needs Analysis and Competency Requirements Plan

A training needs analysis report will be prepared to determine what training is required for which employees/operators at the Hydrogen Plant Site. This analysis will be used to produce a timeline of training of employees/operators to ensure that a competent and correctly trained team is operating the Hydrogen Plant. As part of the training needs analysis, a competency requirements plan will be produced to identify what competencies each employee/operator require. This will be informed by the safety critical activity identification described previously, with additional assessment with support of human factors experts where required.

4 Methods Employed

The below methods represent current industry standard methods regarding hazard identification, characterization, consequence and risk analysis and shall be updated and amended as practice evolves and in consultation with appropriate local and national authorities.

4.1 HAZID Workshop

The aim of a HAZID workshops is to identify reasonably foreseeable hazards and their respective prevention and mitigation measures. This also allows opportunities to identify where additional controls may be required, to enable the implementation and management of the proposed measures and hence present a robust safety justification for the design of the Hydrogen Plant.

An initial Preliminary Hazard Assessment ("PHA") workshop has been carried out and a report prepared. The PHA report describes the use of guide words, and includes a completed Hazard Register based on currently available information. This includes the identified hazards in the current design of the facility.

As the Hydrogen Plant progresses through development and towards operations, further hazard identification workshops will be carried out using the guidance provided by the HSA's Technical Land Use Planning guidance.

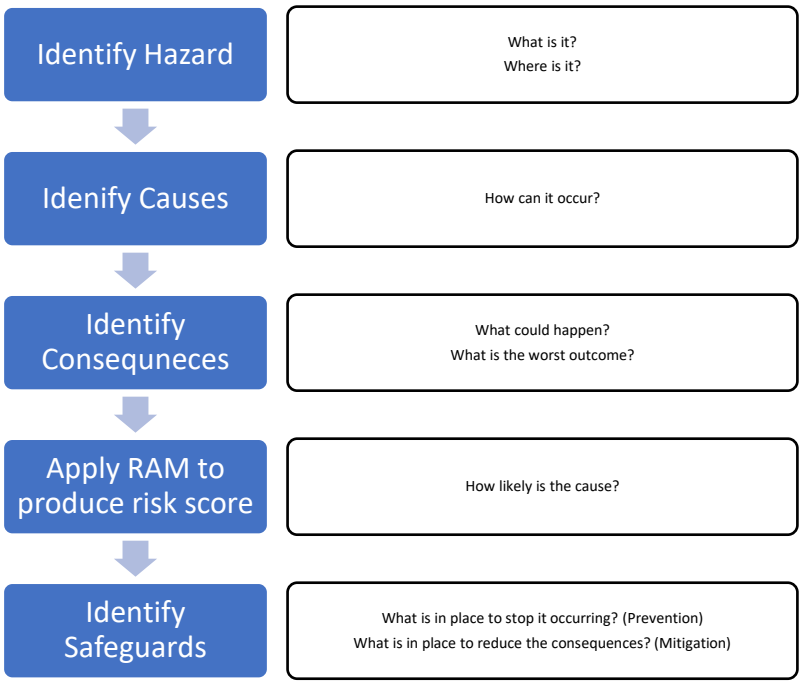
The scope of the complete set of HAZID workshops will consider all lifecycle phases, namely:

1. Installation and transportation;

2. Commissioning;
3. Operation;
4. Maintenance; and
5. Decommissioning.

The methodology for the HAZID assessment is summarised in Figure 1 below

Figure 1 – Workshop Method Overview

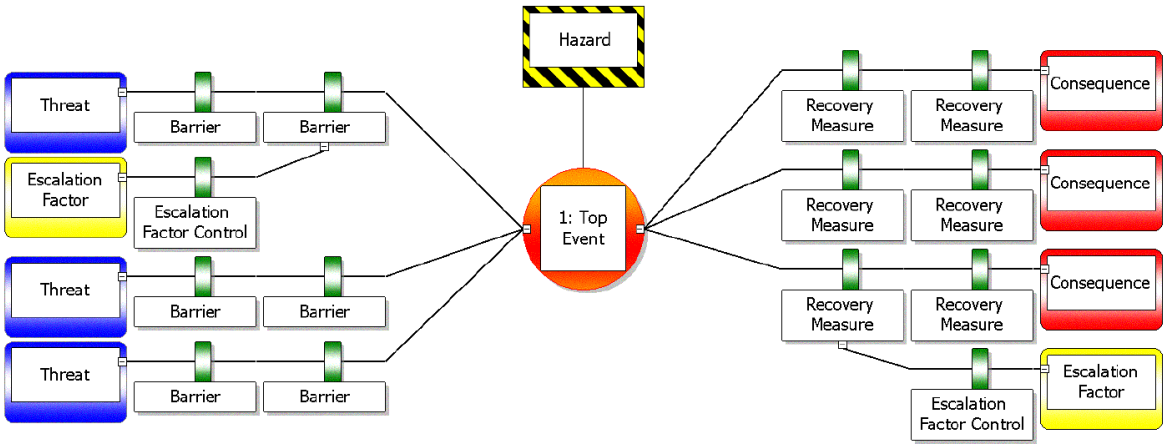


4.2 Bowtie

Given the current knowledge on the nature of the hazards at the facility, a qualitatively assessment of hazards which are deemed to be Major Accident Hazards ("MAH") is deemed to be commensurate with the level of risk. The bowtie methodology for risk assessment has been employed, with bowtie diagrams produced for the major MAH identified during the HAZID workshop. The process for identification of MAH that are to be subjected to bow-tie analysis will align with the COMAH definition of a major accident:

"an occurrence such as a major emission, fire, or explosion resulting from uncontrolled developments in the course of the operation of any establishment covered by these Regulations, and leading to serious danger to human health or the environment, immediate or delayed, inside or outside the establishment, and involving one or more dangerous substances".

The bowtie technique is a way of clearly illustrating how risk is being managed within a facility, operation, task, etc. It helps to ensure that risks are managed rather than just analysed, partly by going beyond the usual risk assessment "snapshot" and highlighting links between the risk control and management systems.



The key elements of a bowtie are:

- The **Hazard** that has the potential to give rise to the unwanted event you are concerned about. This is illustrated in the yellow/black striped box.
- The unwanted event you are concerned about if the hazard is realised. This is called the **Top Event** and is the red circle, which forms the "knot" of the bowtie.
- The credible causes of the unwanted event. These are the **Threats** and are illustrated in blue on the left hand side of the diagram.
- The unmitigated **Consequences** of the unwanted event. These are illustrated in red on the right hand side of the diagram.
- An **Escalation (or Degradation) Factor** which could compromise the integrity of a barrier. These are illustrated in yellow.
- The **Barriers** in place to prevent the unwanted event occurring or minimise its consequences. Those on the left hand side of the diagram prevent the hazard being realised and are categorised as **Prevention**. Those on the right hand side minimise the ultimate consequences of the hazard if realised and hence represent **Mitigation**. Barriers can also be included to eliminate or minimise the impact of an Escalation Factor on the integrity of a specific barrier, either prevention or mitigation.

The linking of the specific systems, processes, procedures etc. must be in place to ensure the integrity of these barriers through the identification of Safety Critical Equipment ("SCE"), i.e. plant, equipment etc. and Safety Critical Activities ("SCA") (operations, inspections, checks etc.) and the identification of the roles and responsibilities to ensure these work effectively.

The bowtie methodology provides a clear, auditable trail from hazards from identification to implementation for the specific systems, processes, and procedures. The bowtie also provides a link to performance standards and responsibilities, and supports the argument to reduce the associated risks so far as is reasonably practicable ("SFAIRP").

Throughout the development of the bowtie diagram the basic principles of SFAIRP will be adhered to ensure the initial steps of meeting legislation and good practice safety measures / barriers are included. In addition, throughout the process, the question 'what more can be done to reduce the risk?' will be asked. This will support the identification of further risk reduction measures, focussed on the MAH, in the context of the rigorous structure provided by the bow-tie analysis. This will directly support the reduction of risk SFAIRP. For less significant hazards, adequate management of these hazards will be demonstrated through the hazard register.

It is proposed that the bowties will be validated in a bowtie workshop, to ensure that good safety measures/barriers are introduced and to ensure risks are reduced SFAIRP.

4.3 Identification of Safety Critical Activities and Safety Critical Equipment

The bowtie analysis will characterise barriers based on the extent to which they are implemented by hardware or operational or organisational activities. SCE constitute the specific items of equipment that act as barriers, e.g. fire detection systems pipework or isolation valves. SCA are the operational activities carried out by people that implement barriers, for example, response to fire detection or high temperature alarms, maintenance of equipment, etc.

The bowtie analysis focuses on MAH; therefore, any equipment or activities responsible for preventing the realisation of a hazard or mitigate its effects should be considered safety critical. The bowties will be developed via a desktop exercise and subsequently validated in a workshop to ensure their accuracy and completeness. A briefing note will be produced and circulated prior to the workshops; the validated bowties for the identified MAH will be included in a report, which will also include a tabulated version of all identified SCE and references performance standard identifiers.

Where possible prevention measures should include automated processes as well as people-centered measures to ensure human error is reduced so far as is reasonably practicable, whilst not placing entire reliance of the functioning of automated systems.

4.4 Development of Performance Standards

Performance standards will be developed for all identified SCEs. These are specific to individual functions, pieces of SCE or groups of similar equipment. The performance standards developed will take into consideration good practice standards, as identified in Sections 2.2.1 and 1. Therefore, the performance standards developed will also provide a firm basis for future hydrogen generation projects.

Performance standards consider the following requirements:

- **Functionality**: what does the equipment need to do and how is this assured by design? This refers to the safety functionality only;
- **Availability/Reliability**: consideration of non-functional requirements – this will include Safety Integrity Level (SIL)/Performance Level (PL), where applicable;
- **Maintainability**; consideration of the requirement for maintenance and the need for access to ensure that the SCE can be maintained to sufficient integrity to perform its safety function;
- **Survivability**; consideration of the extent to which the SCE is required to survive an emergency event in order to perform its required safety function; and
- **Dependencies**; consideration of dependencies to other SCE.

Initially these performance standards will be developed to ensure that the design includes all necessary requirements to ensure safety of the establishment. These will be updated on completion of commissioning to ensure that all equipment installed meets the performance requirements and that, where applicable, suitable maintenance and inspection regimes have been identified throughout the operation phase, for example, identifying critical maintenance and operations tasks that need to be carried out to maintain the integrity of SCE.

4.5 ATEX Assessment

Part 8 of the General Application Regulations 2007 transposes the (ATEX) Directive 1999/92/EC1 of the European Parliament and of the Council of 16 December 1999 on minimum requirements for improving the safety and health protection of workers

potentially at risk from explosive atmospheres and the risks from fire and explosion arising from flammable substances stored or used in the workplace.
Part 8 of the General Application Regulations 2007 also replaces the Safety, Health and Welfare at Work (Explosive Atmospheres) Regulations 2003 (S.I. No. 258 of 2003), which are revoked from that date.

Therefore, compliance with ATEX for workplace safety requires the following:

A risk assessment of the proposed design of the hydrogen generation with regard to the following:

i. the likelihood that explosive atmospheres will occur and their persistence,
ii. the likelihood that ignition sources, including electrostatic discharges, will be present and become active and effective,
iii. the installations, substances used, work processes and their possible interactions,
iv. the scale of the anticipated effects,
v. any places which are or can be connected via openings to places in which explosive atmospheres may occur, and
vi. such additional safety information as the employer may need in order to complete the assessment;

Having carried out an assessment under and in accordance with this Regulation, an explosion protection document shall be prepared, as soon as practicable and before the commencement of work. The explosion protection document shall be maintained throughout the life of the Hydrogen Plant. Further obligations are clearly specific in Part 8 of the General Application Regulations 2007.

The explosion protection document shall specify each of the following:

a. that the explosion risks have been determined and assessed;
b. that measures have been or will be taken pursuant to this Part and that such measures are adequate having regard to the risks;
c. the places which have been classified into zones in accordance with Regulation 170 and, in respect of such classification, where Schedule 10 applies;
d. that the workplace and work equipment, including warning devices, are designed operated and maintained with due regard for safety and that, in accordance with Part 2, Chapter 1 and Part 7, Chapter 1, adequate arrangements have been made for the safe use of work equipment;
e. the purpose of any co-ordination required by Regulation 175 and the measures and procedures for implementing it.

4.6 Quantitative Risk Assessment

A Quantitative Risk Assessment (the “TLUP QRA”) has been prepared in accordance with the guidelines set out in the HSA's Technical Land Use Planning Guidelines. The TLUP QRA has been submitted to the HSA as part of the planning application submission. The purpose of the TLUP QRA is primarily to assess the offsite risks to human health and the environment for the purposes of determining the suitably of the preferred site for the Hydrogen Plant. Further on-site QRAs will be prepared as the Hydrogen Plant progresses towards construction, into and during operations.

5 Control of Operations

Should cover the use of written procedures, the proper maintenance of plant and the adoption or use of good practice.

Written procedures for the appropriate maintenance and operation of plant, including SCE shall be established in conjunction with original equipment manufacturers ("OEMs"). These procedures will include industry best practice gathered from similar facilities supplied by the OEMs.

The procedures will establish those personnel responsible for the safe operation of the Hydrogen Plant as well as those responsible during an Emergency Response, as well as the processes to be followed during an Emergency Response.

6 Change Management

Where new plant of processes are introduced to the Hydrogen Plant, the MAPP shall be reviewed by the SHSP to ensure the continued appropriateness of the document. Equipment OEMs shall be required to provide detailed operational procedures that can be incorporated within the MAPP. Senior Management shall be responsible for ensuring the MAPP is updated as a result of a change or modification of equipment at the Hydrogen Plant Site. The MAPP shall be revised and reissued to the HSA following such a change.

All equipment modification, maintenance, upgrade or replacement, shall required the approval of the SHSP to ensure the validity of the MAPP following such works.

7 Emergency Response

Mercury acknowledges the necessity to plan for emergencies at the Hydrogen Plant Site and has engaged with the Health and Safety Authority, Mayo County Council and Sligo County Council as part of the design process, prior to submission of a planning application to An Bord Pleanála. Mercury will continue to engage with the local emergency services and the appropriate authorities in the development and implementation of an Emergency Response Plan ("ERP").

We understand the Sligo Fire Department ("SFD") will be responsible for coordinating responses for emergencies and have already incorporated firefighting water reservoirs on the Hydrogen Plant Site as well as fire hydrants and backup power supplies following the SFD's review of preliminary drafts of the Hydrogen Plant layout. We will continue to engage openly with the SFD in the preparation of an ERP in advance of commencement of operations.

Regulations 9 and 10 of COMAH set out the following objectives for an ERP:

1. Identification of significant sources, types, scales and consequences of potential major accidents, including malicious acts;
2. Establishment of the objectives of the response, both technical and organisational;
3. Identification of the components (procedures, roles, resources – hardware and software) required to achieve the response;
4. Identification of the organisations and key post holders involved;
5. Identification of the expertise, arrangements and capabilities of the organisations and individuals which are relevant to the procedures and the roles needed, and the adequacy of the resources identified for responding to the identified major accident scenarios;
6. Determination of how all the responses will be coordinated including any 'sub-plans';
7. Allocation of responsibilities for the response and associated components;
8. Identification of situations where the routine procedures and resources are not appropriate or sufficient, what to do instead; and

9. Identification of the means to ensure the plans will be put into effect as intended.

The ERP will consider the long and short-term recovery plans; and a timeline of events should be produced to detail key tasks to be completed to mitigate the risk. The four key parts of creating an emergency response plan are:

1. Contain and control incidents so as to minimise the effects and to limit damage to persons, the environment and property;
2. Implement the measures necessary to protect persons and the environment from the effects of major accidents;
3. Communicate the necessary information to the public and to the emergency services and authorities concerned in the area; and
4. Provide for the restoration and clean up of the environment following a major accident

In addition to the above, the ERP will include contact details for site personnel and emergency services, maps and plans of the Hydrogen Plant Site, emergency procedures, chemical inventories, and equipment lists, as well as a fire response strategy and appropriate training requirements for onsite staff.

Emergency situations to be planned for within the ERP will be identified through a series of workshops to be conducted by Mercury, with minutes of findings to be issued to the SFD. Mercury has already conducted a Preliminary Hazard Assessment which can These workshops will be held prior to the commencement of construction works at the Hydrogen Plant Site and will be reviewed annually as part of a wider internal audit process.

Appropriate responses to emergencies will be developed using industry best practice and where possible by reference to examples in Ireland and elsewhere around the world. Mercury's SHSP will work with the SFD and other appropriate authorities (for example the HSA) where applicable in refining the appropriate responses included within the ERP and as part of this MAPP. Mercury's SHSP shall seek external input or review from suitably qualified professionals to consider the completeness of the ERP as well as the appropriateness of the responses contained therein.

The regular review and update of the ERP shall be defined at a later date in accordance with industry best practice and with guidance from the HSA, SFD and other appropriate authorities.

8 Measurement and Management

Mercury is committed to the use of safety performance indicators as outlined in the Methods Employed Section of this document. Other measures to ensure compliance with the policy shall be implemented as the MAPP evolves, taking feedback from industry best practice and the appropriate local and national authorities.

Senior Management, in particular the CEO of Mercury Renewables and the SHSP, shall be responsible for ensuring the regular review of safety performance indicators and ensuring existing safety performance indicators are acted upon.

Near misses are required to be reported to the SHSP and shall be investigated to ensure safety policies have been appropriately adhered to. Where gaps in policies are identified through the investigation, that have contributed to the near miss, the policies shall be updated following the appropriate Methods Employed. A detailed reporting process regarding near misses shall be established prior to commencement of operations.

Regular health and safety reporting protocols shall be established prior to commencement of operations at the Hydrogen Plant Site, including the use of safety performance indicators.

9 Audit – Internal and External

You should state how you will audit the implementation of the policy and the suitability and fitness of the management system to deliver it and particularly the involvement of senior management.

The implementation of the MAPP shall be audited through periodic internal and external reviews. The timing of these reviews shall be established within the policy. Internal audits will be conducted by a senior management team member, other than the SHSP to ensure integrity of the review.

The external audits shall include a review of the suitability and fitness of the management system to deliver the MAPP. The provider of the external audit service shall have prior experience in reviewing similar COMAH facilities. The external audits shall report directly to the CEO and senior management team, including the SHSP.

10 Signed and Authorised

Document Version:

Prepared by: Tim Bills-Everett
Signed:

Authorised by: John Duffy
Position: CEO
Signed: