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# Future Fuels: Applying Process Safety Methodology to Project Design

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**ABSTRACT**

*The rapid expansion of future fuels projects introduces unique challenges, particularly in the safe integration of new and complex technologies at scale. Operators can often have limited experience with major incidents associated with new technologies and may not have an in depth understanding of the new equipment failure modes. Owners face pressure to minimise design costs due to marginal project economics and to meet committed schedules. This paper outlines some of the process safety challenges encountered during the design phase of future fuels projects in Australia and shares lessons learned from GPA's experience as a designer and owner's engineer.*

*Understanding of Safety in Design (SID) study requirements can vary significantly between project owners. Factors influencing SID scope include whether the owner has previously operated a Major Hazard Facility (MHF), has established SID standards, or is accustomed to operating in lower-risk environments where hazards are well understood and codes and standards are well established.*

*Performing a full suite of SID studies can reduce the lifecycle cost of a project and prevent process safety incidents during the operations phase. However, these studies also increase the costs during the project design phase. Consequently, project managers may choose to minimise SID studies with preference for reduced costs and time, leading to risks not being fully understood at a time when it it is most practicable to reduce or eliminate then and avoid more costly modifications or delays later in the project delivery.*

*This paper will consider learnings from safety in design studies based on GPA's experience across numerous projects. We will outline some of the challenges that we have observed from HAZOP studies undertaken for new technologies and recommend where additional studies, such as bowtie risk assessment can be beneficial, to ensure design risk is reduced So Far As Reasonably Practicable (SFAIRP).*

*Some of the challenges reviewed include; managing overseas vendors with standard package designs not necessarily compliant with Australian Standards, limited understanding of equipment failure mechanisms, and the unique properties of hydrogen, such as its high ignition probability and propensity to explode with or without congestion, and how this can impact facility layout.*

## KEY WORDS

*Process Safety in design and operations, HAZOP, bowtie rsk assessment, novel technologies, future fuels, hydrogen, lessons learned, fundamental best practice*

## BIOGRAPHY

Lisa is a chemical engineer with over 25 years of experience in top-tier oil and gas companies and as a principal risk consultant at GPA. She has extensive expertise in operations engineering, engineering management, reliability, maintenance, and process safety consulting. Throughout her career, Lisa has experienced and learned from major incidents, been involved in recovery efforts, experienced the introduction of MHF legislation, and led the preparation, audit, and licensing of two safety cases. Recently, she has facilitated safety in design studies for future fuels projects involving new and novel technologies.

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