

Hydrogen Safety Plan

A3 Labs (A3L) and its subcontractor Next Hydrogen Corporation (Next Hydrogen) plan to apply a “defense in depth” approach to the design and conduct of the safety plan. A3L plans to use a combination of equipment qualification screening, modeling, non-coupled and coupled testing, system range & boundary condition analysis, methodology enforcement, training, signage, “smart” diagnostics and monitoring and continuous improvement reviews to establish the foundation of the safety plan.

Next Hydrogen is currently assembling a hydrogen production facility in Canada, the commissioning of which Next Hydrogen anticipates to complete in Q1 2017. A3L will be leveraging upon Next Hydrogen’s experience in this design and implementation process, which is subject to the Canadian Hydrogen Installation Code designated CAN/BNQ1784-0000, which includes requirements which we believe to be comparable to that of NFPA 2.

Next Hydrogen plans to contract with Dr. Andrei Tchouvelev to be the codes and standards compliance and safety expert to advice on this project. He is currently the chairman of hydrogen safety (TC-197) for the International Standards Organization, and he also assisted with guiding the this system through the TSSA approval process in Ontario Canada. A copy of the approval letter is attached to this proposal.

AAA Northern California, Nevada & Utah, the parent company of A3L, has a long history of supporting safety principles, with a focus on driver and road safety. This commitment is also reflected in the mission and principles of A3L. A3L further intends to leverage the experience of Next Hydrogen gathered through multiple design, development, construction, integration, commissioning and operations projects for hydrogen facilities.

As part of the safety plan, A3L plans to use the identification of safety vulnerabilities (ISV) process to inventory potential hazards and issues of operational. This will allow A3L to document and monitor change control processes to ensure that the vulnerabilities are identified and properly addressed. Given that this this design has been developed, constructed and commissioned for operation, A3L has confidence that the material safety vulnerabilities have been identified and properly mitigated.

A3L plans to engage in a multi-stage process to reduce risks by continuously tracking to ensure the characterization and mitigation are updated and sufficient. As an example, the proposed facility will be located outdoors in a parking lot, and will be housed in metal cabinets behind a cinder block wall. This facility is designed to operate in an automated fashion, and customers will only interact with the fuel dispenser. The plan includes providing multiple ways for emergency response personnel to access facility status information (including internet-accessible updates and on-site displays) to ensure that information is provided quickly and no single point of failure will impede any emergency response. The plan includes both scheduled and unscheduled response exercises to ensure the emergency response personnel are adequately supported with update information.

Based on Next Hydrogen’s experience with hydrogen facilities, A3L intends to implement operational procedures of the facility that have been tested in the field. Additionally, A3L plans to conduct regular training to R&M personnel, user groups, response personnel and special tours/briefings. The proposed operational procedures will be exercised in both verifications tests and in commissioning phases to ensure adequacy and efficiency.

A3L's safety plan will also address equipment and management integrity to ensure that equipment use and facility operations are conducted in the intended manner within predictable and sound conditions. The plan will model the role of equipment within the system to ensure that the range of operation and out-of-spec conditions are well recognized, and that the equipment falls within the parameters defined in the specification. Simulated loads will be used to characterize both system responses and specific burdens on sensitive equipment or points of vulnerability. Further, protective circuitry or mechanical devices will be installed to address vulnerabilities.

A3L also plans to implement change control procedures that will review engineering change orders and subject proposed changes to a multi-disciplinary review. Proposals impacting safety will be prioritized first. Change control criteria will include efficiency, operations, maintenance, reliability, logistics and life cycle impacts. A3L plans to implement a configuration enforcement procedure, which is a multi-layer approach starting with the reference control drawing set, the bill of material, logistics planning (test equipment and spares allocations) and quality assurance. No change will be implemented without the approval of the cognizant engineer.

Next Hydrogen's team has offers experience across a number of fields, including engineering, safety, insurance, public interest, academia and environmental organizations, to advise on hydrogen energy operations and safety. The proposed facility will have a hydrogen safety plan in accordance with the DoE Safety Planning Document dated March 2016. A3L plans to post a summary safety plan for public viewing along with information of the facility.

A3L's safety plans include safety reviews conducted as part of the CDR. The BOM list will be cross referenced to safety notifications, the factory tests will include a safety component, the equipment will be inspected for dangerous defects or shipping damage when received and both in-range and out-of-range system tests include a safety component. Safety reviews will also be conducted as part of a change proposal, a facility improvement initiative, response to lack of availability of supplied parts and in reaction to an incident or a trend analysis predicting an incident. The risk committee includes the cognizant engineer, QA, logistics, procurement and one member of senior management.

A3L's safety plan includes analysis of safety events by the cognizant engineer and the safety committee, as appropriate. Any material learnings from such analysis will be used to implement appropriate changes in operational procedures, signage, R&M, purchasing, QA or logistics. All safety events, regardless of magnitude, will be examined by the risk committee prior to a release to resume normal operation. The risk committee will also oversee scheduled and unscheduled emergency response exercises. A3L will conduct unscheduled self-audits, which will be led by the QA department or by the risk management team.