Refueling Infrastructure for Alternative Fuel Vehicles: Lessons Learned for Hydrogen

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Infrastructure Lessons Learned

- **Fueling Station Location and Customer Selection**
  Coordination between the OEM and Hydrogen Station Developer is crucial for optimal selection of sites / customers
  
  **ISSUE**
  - Suboptimal site selection has resulted in low station utilization
  
  **SOLUTIONS**
  - Clear understanding / agreement of OEM FCV deployment plan is critical
  - Easy station access from a highway or major road is important
  - Ability to offer 24/7 access is a factor

- **Hydrogen Infrastructure Permitting**
  Permitting process is fraught with unknowns, obstacles and delays
  
  **ISSUES**
  - The permitting process through local authorities, especially fire authorities, is new each time and is highly variable due to unfamiliarity with hydrogen specifications and lack of common requirements
  - Building departments in general are unclear of requirements
  - Equipment may not meet local and state certifications, and certification requirements change from one jurisdiction to another
  - NEPA and local environmental processes are lengthy and not widely understood
  
  **SOLUTIONS**
  - Meet early to understand requirements and kick-off the permitting processes as soon as possible
  - Provide education to authorities up-front and bring back when station is running
  - A need for permitting standardization
  - A need for equipment / station standardization rather than “one-off” designs
NextEnergy (Detroit) Station
Infrastructure Lessons Learned
Infrastructure Lessons Learned

- **Infrastructure Legal Contracts**
  - Legal agreements take longer than expected: customers, suppliers, OEM’s

  **ISSUES**
  - Indemnification and liability: BP high risk position (i.e. customers vs. suppliers)
  - Site owners exert some level of control over access / supply
  - Hydrogen sales - reluctance to pay for fuel

  **SOLUTIONS**
  - ????

- **Hydrogen Purity**
  - Purity issues must be resolved prior to commercialization

  **ISSUES**
  - No one wants to accept the H2 purity risk in demonstration projects
  - Equipment suppliers have difficulty in meeting purity guidelines
  - Limited number of laboratories that can test to extremely tight purity guidelines which translates into high cost
  - No ASTM test standards
  - Care must be taken while sampling
  - Significant time and financial commitment to test for and assure purity
  - Contaminants can come from the open end of the nozzle

  **SOLUTIONS**
  - A need for mutual agreement between OEM’s and Hydrogen Station Developers on purity specifications
  - A need to finalize development of test standards
SMUD Station (in conjunction with Ford)
Infrastructure Lessons Learned
Infrastructure Lessons Learned

- **Community Engagement Prior to Station Construction**
  Engagement of the community is importance and cannot be taken for granted
  
  **ISSUE**
  - Thorough due diligence of local landscape and early buy in from local officials is critical
  
  **SOLUTION**
  - Present ideas and solicit community feedback as early as possible

- **Station Equipment Acquisition – Design – Construction - Operation**
  The 350 bar systems seem to have reached a comfortable level of mature and safe performance but there is more work to do
  
  **ISSUES**
  - New 700 bar systems need to be proven for long-term use and reliability
  - Vehicle communication standardization continues to be an issue – IR vs. RF
  - There is confusion between the NFPA specifications which complicates design
  - Local site partners bring unique requirements to each project which can complicate and delay progress
  - Commercial scale hydrogen stations have large footprints
  - Lack of technology to meet Weights and Measures requirements
  - BP rigorous processes result in unexpected suppliers’ delays
  - BP rigorous safety construction processes result in additional efforts to educate third parties
  - Low station utilization has not allowed for rigorous testing of demonstration equipment
  
  **SOLUTIONS**
  - NFPA 2 should help to clarify requirements
  - Lessons learned from 350 bar systems should help the transition to 700 bar systems
  - A need for a concerted effort to increase station utilization
Burbank - Existing Station / Site
Infrastructure Lessons Learned