

# Las Vegas Hydrogen Energy Station Case Study

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# Case Study Rationale

- The schedule duration from the start of engineering to start-up was 30 months.
- Opportunity to examine use of time for potential lessons learned.



# Good Example for Study

- Overall Assessment – Success Story
- Located in Large Municipality
- Complex, Highly Integrated Asset
- Multiple Partners and Players
- Multiple Interfaces
- New Technologies



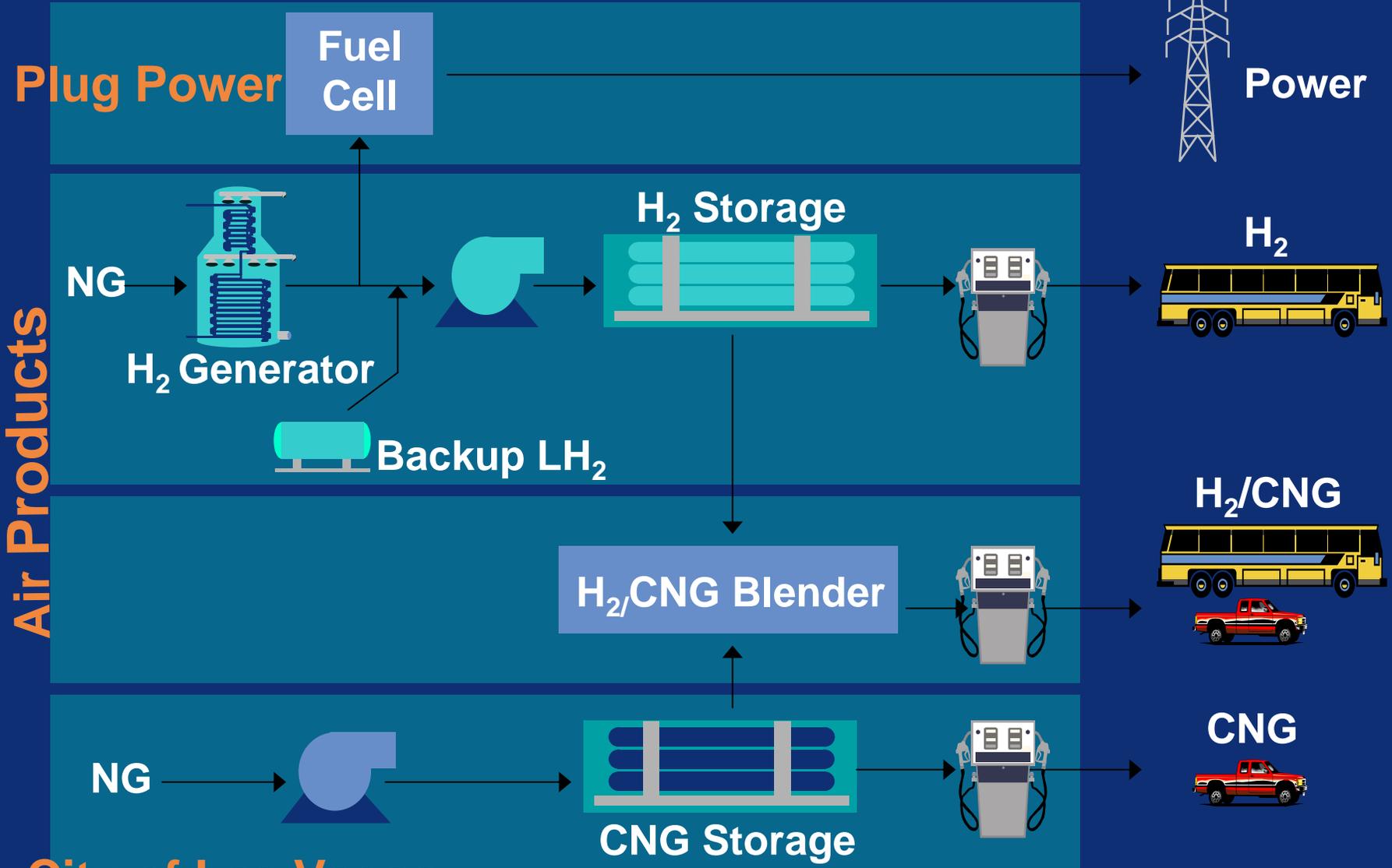
# Las Vegas Hydrogen Fueling and Energy Station – Compression, Storage and Fueling



# Las Vegas Hydrogen Fueling and Energy Station – Distributed Hydrogen Generation and PEM Fuel Cell Power Generation



# Nevada Hydrogen Project



City of Las Vegas

# Case Study Content

- **Timeline Comparison – Original Plan to Actual Results**
- **Summary of Contributing Factors**
- **Background on Players / Factors**
- **Progress Impacts**
- **Permits**
- **Lessons Learned**



# Original Project Timeline

ID	Task Name	2000				2001				2002				2003				2004					
		Q4	Q1	Q2	Q3																		
1	Phase 1 - Engineering and Design	█																					
2	Phase 2 - Manufacture, Install, Start-up					█																	
3	Phase 3 - Operation Period									█													

- Phase 1 – Engineering and Design
  - November 1999 to November 2000
- Phase 2 – Manufacture, Install, Start-up
  - November 2000 to November 2001
- Phase 3 – Operation Period
  - November 2001 to September 2004

# Actual Project Timeline

ID	Task Name	2000		2001				2002				2003				2004			
		Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	Phase 1 - Engineering and Design			[Bar]															
2	Phase 2 - Manufacture, Install, Start-up							[Bar]											
3	Phase 3 - Operation Period																		

- Hydrogen Generator Start-up at Site Achieved August 2002
- Site Opening Dedication in November 2002
- Currently 6 Quarters into the scheduled two year demonstration operating period

# Summary of Contributing Factors

- Program Definition
- Station Definition
- Interface Dependencies
- Site Selection Effort
- Vehicle Demand Influence
- Municipal Experience
- New Technologies



# Background – The Team / Players

<b><i>Entity</i></b>	<b><i>Scope of Responsibility</i></b>
DOE	Program Contract Issuance
Air Products	Prime, Program Mgmt, H2 Installations, O&M
CLV	Site Real Estate, Fleet Mgmt
Plug Power	PEM Fuel Cell, O&M
Bechtel NV	Vehicle Conversion Contract Mgmt
Collier Tech	Vehicle Conversions
Nevada Power	Export Power Grid Connection for Fuel Cell
RTC	CNG Station Scope

# Notable Milestones in Execution

- **Final Program Plan Developed – May 2000**
- **Site Selection Confirmation – August 2000**
- **Site Safety Review – February 2001**
- **Permit Coordination – Summer 2001**
- **CNG Site Permits Issued – August 2001**
- **H2 Site Permit Submit – Sept / Oct 2001**
- **CNG Site Construction – Feb / Mar 2002**
- **H2 Site Foundations – June 2002**
- **LH2 Work Complete – July 2002**
- **Co-Production Work Complete – August 2002**
- **Connection to Grid for Export Power – August 2002**



# Progress Impacts

## ● Program Definition

- Vehicle Fleet and Fuel Cell H2 Demand
- Expected Demand Timeline and Supply Rqmts
- CNG Site and CNG Supply
- Provides Definition for Asset Requirements

## ● Station Definition

- LH2 Added for H2 Demand Timeline
- Export Power Grid Connection Required
- CNG Interface for CNG Supply Required
- Commonality with RTC Fuel Accounting
- Utility Requirement Consideration for Site Selection and Site Infrastructure Work



# Progress Impacts

## ● Interface Dependencies

- CNG Site Required
- CNG Pressure Rqmt
- CNG Permitting Priority
- CNG Installation Priority
- Power Export Required
- Vehicle Demand for Fuel



## ● Site Selection Effort

- Utility Requirements
- CNG Schedule Dependency

# Progress Impacts

- **Vehicle Demand Influence**

- **Currently One F150 LDV and One Bus**
- **Schedule Originally Focused to Meet Vehicle Demand**

- **Municipal Experience**

- **Permit Process Not Clear to Lead Resource for this Effort**
- **Resource Availability for Permit Effort**
- **New Technology Added to Gap**



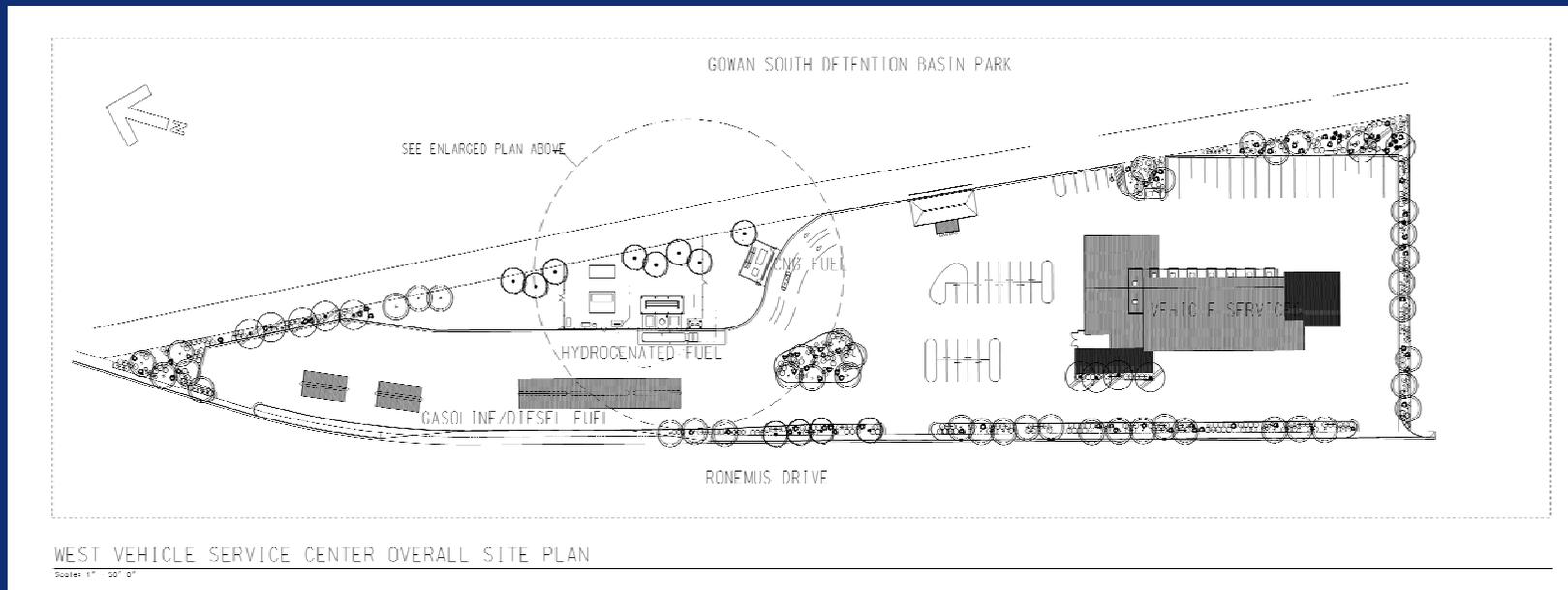
# Progress Impacts

## ● New Technologies

- Uncharted Territory for Permit Process and Agencies
- Manage Risk
- Development Content – Schedule Variables
- Vehicle Testing and Progress
- Export Power Challenge
- CNG Feed



# Permits – Site Location



# Permits – Requirements

- **Fire Marshall**
- **Civil Structural**
- **Electrical**
- **Air (Clark County – Non-attainment Area)**

# Lessons Learned / Observations

- **Program Definition**
  - **Complex programs may evolve where required for success**
  - **Additional development can improve, but may not be feasible prior to kick-off**
- **Station Definition**
  - **Evolution of program impacts details of station**
- **Interface Dependencies – Proficient due diligence may not eliminate all:**
  - **Scope affects**
  - **Schedule affects**
  - **Emergent dependencies**



# Lessons Learned / Observations (Cont)

- **Site Selection Effort**
  - Not uncommon as an issue
  - Difficult to fully and efficiently factor variables into plan, where proactive site confirmation is not feasible
- **Vehicle Demand Influence**
  - Schedules tend to focus towards demand
- **Municipal Experience**
  - Prior Municipal Experience Factors into Time Required
- **New Technologies**
  - Outreach Required



# Conclusions

- **This Program helps pave the way for improved speed of execution in project permitting and installation for similar sites.**
- **The Las Vegas Energy Station case study provides a short list of predefined pitfalls one might expect for a similar installation.**
- **Programs of this nature help advance outreach efforts with local government agencies and the public.**
- **Adaptive project management will always be required to effectively mitigate the multitude of risks and challenges that can be expected on any project.**

# City of Las Vegas H2 / CNG Bus



Thank you

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