California Energy Commission

CONSULTANT REPORT

North Coast and Upstate Fuel Cell Vehicle Readiness Project

Task 2.4 Micrositing Summary Report

Prepared for: **Redwood Coast Energy Authority**
Prepared by: **Schatz Energy Research Center**

California Energy Commission

Edmund G. Brown Jr., Governor

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PREFACE

Assembly Bill (AB) 118 (Nüñez, Chapter 750, Statutes of 2007), created the Alternative and Renewable Fuel and Vehicle Technology Program (ARFVTP). The statute authorizes the California Energy Commission (Energy Commission) to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's climate change policies. AB 8 (Perea, Chapter 401, Statutes of 2013) re-authorizes the ARFVTP through January 1, 2024, and specifies that the Energy Commission allocate up to $20 million per year (or up to 20 percent of each fiscal year's funds) in funding for hydrogen station development until at least 100 stations are operational. The Energy Commission has an annual program budget of approximately $100 million and provides financial support for projects that:

· Develop and improve alternative and renewable low-carbon fuels;

· Optimize alternative and renewable fuels for existing and developing engine technologies;

· Produce alternative and renewable low-carbon fuels in California;

· Decrease, on a full fuel cycle basis, the overall impact and carbon footprint of alternative and renewable fuels and increase sustainability;

· Expand fuel infrastructure, fueling stations, and equipment;

· Improve light-, medium-, and heavy-duty vehicle technologies;

· Retrofit medium- and heavy-duty on-road and non-road vehicle fleets;

· Expand infrastructure connected with existing fleets, public transit, and transportation corridors; and

· Establish workforce training programs, conduct public education and promotion, and create technology centers.

The California Energy Commission (Energy Commission) issued solicitation PON-14-607 to fund Zero Emission Vehicle (ZEV) Readiness activities. To be eligible for funding under PON- 14-607, the projects must also be consistent with the Energy Commission's ARFVT Investment Plan updated annually. In response to PON-14-607, the Redwood Coast Energy Authority (Recipient) submitted application number 11, which was proposed for funding in the Energy Commission's Notice of Proposed Awards on March 17th, 2015, and the agreement was executed as ARV-14-055 on May 8th, 2015.

Please use the following citation for this report:

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ABSTRACT

This report presents a summary of micrositing work conducted for the *North Coast and Upstate Fuel Cell Vehicle Readiness Plan Project*. Micrositing work involves developing preliminary hydrogen fueling station designs, identifying specific potential locations for hydrogen fueling stations, and engaging with key stakeholders. The work conducted for this report focuses on outreach and engagement intended to investigate potential locations and partners for the development of the first fueling stations in the cities of Redding and Eureka. This work also leveraged the *Task 2.4 Site Readiness Report* to engage with stakeholders.

Keywords: hydrogen, fuel, cell, vehicle, FCEV, station, micrositing, hydrogen fueling infrastructure, planning, ARFVTP, AB 8, AB 118, NFPA 2, North Coast, Upstate, Eureka, Redding

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EXECUTIVE SUMMARY

This *Task 2.4 Micrositing Summary Report* is an interim deliverable within the larger Fuel Cell Electric Vehicle Readiness Plan project efforts covering an 8-county region in North Coast and Upstate California. The goals of this report are to:

- Briefly summarize the results of a more detailed micrositing effort, the details of which are available in a separate interim report titled *Task 2.4 Site Readiness Report*,
- Centralize the information associated with the stakeholder outreach and engagement efforts to garner support and interest in the development of early market anchor fueling stations in the cities of Redding and Eureka, and
- Document next steps needed to build upon and further these efforts.

The summary of detailed micrositing efforts is included in Section 2. This section highlights the recommended areas to focus on for early market station development, summarizes high level station design recommendations, and lists potential site locations for station development. Identified site locations are preliminary as the site owners have not been contacted regarding potential interest.

One method used to garner input from the broader planning region was the release of a public request for information (RFI). The RFI was distributed by numerous local government entities within the project region. Details of the responses are included in Section 3.

Targeted outreach and engagement efforts focused on Eureka and Redding planning and permitting officials, and on CalTrans as a potentially significant near term fleet customer of hydrogen fuel. As a first step in the readiness planning process, these entities are easier to contact and engage. Furthermore, documentation of planning and permitting support, and documentation of a fleet fuel customer, helps establish a narrative to engage the private sector regarding station development, ownership, and hosting. Details of this targeted outreach are provided in Sections 4 and 5.

Additional opportunities arose throughout the project period that enable additional outreach and engagement with other stakeholders. These efforts are documented in Section 6.

Finally, key outcomes and next steps are summarized in Section 7. The intent is for future efforts to easily pick up where this project left off and continue moving progress forward.

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CHAPTER 1: Background

One of the goals of the *North Coast and Upstate Fuel Cell Vehicle Readiness Project* (Project) is to provide guidance for the implementation of fueling infrastructure to support fuel cell electric vehicles (FCEVs) in the North Coast and Upstate regions. Guidance is developed in a two-step process, macrositing and micrositing.

Macrositing provides high-level regional insight into where to focus fueling infrastructure development efforts for first-phase critical anchor sites that will kick-start the regional fuel supply. Furthermore, recommendations on key second and third phase connector sites are provided that will solidify a fueling network to support a robust early market. The macrositing work was completed by the Redwood Coast Energy Authority and the Local Government Commission, and combines local knowledge with state-level modeling results provided by the CARB-funded CHIT-CHAT model[1]. The results of this step are found in the *Regional Hydrogen Infrastructure Plan* developed for this Project under Task 2.1.

Micrositing translates the macrositing results into on-the-ground locations and designs that address the nuanced variables that impact the feasibility of station development. This report discusses the micrositing analysis work completed under Task 2.4 of the Project.

The micrositing effort is further split into two steps. The first step screens sites and evaluates for potential fuel station locations within the critical anchor site regions identified in the macrositing process. These regions are the City of Redding and the City of Eureka. The results of this first step are documented in the *Site Readiness Report*, which is the first deliverable under Task 2.4 of this project.

The second micrositing step involves using this *Site Readiness Report* to reach out to two key stakeholder groups:

- City planning and permitting officials; to communicate the results of this report and the status of station designs and related codes, to obtain insight into preferred location for fueling stations, and to obtain feedback on additional information that they could use.
- Potential station hosts and fuel suppliers; to communicate the status of station designs and costs, and to gauge their interest in considering investment in hydrogen fueling infrastructure.

1 https://www.arb.ca.gov/msprog/zevprog/hydrogen/h2fueling.htm

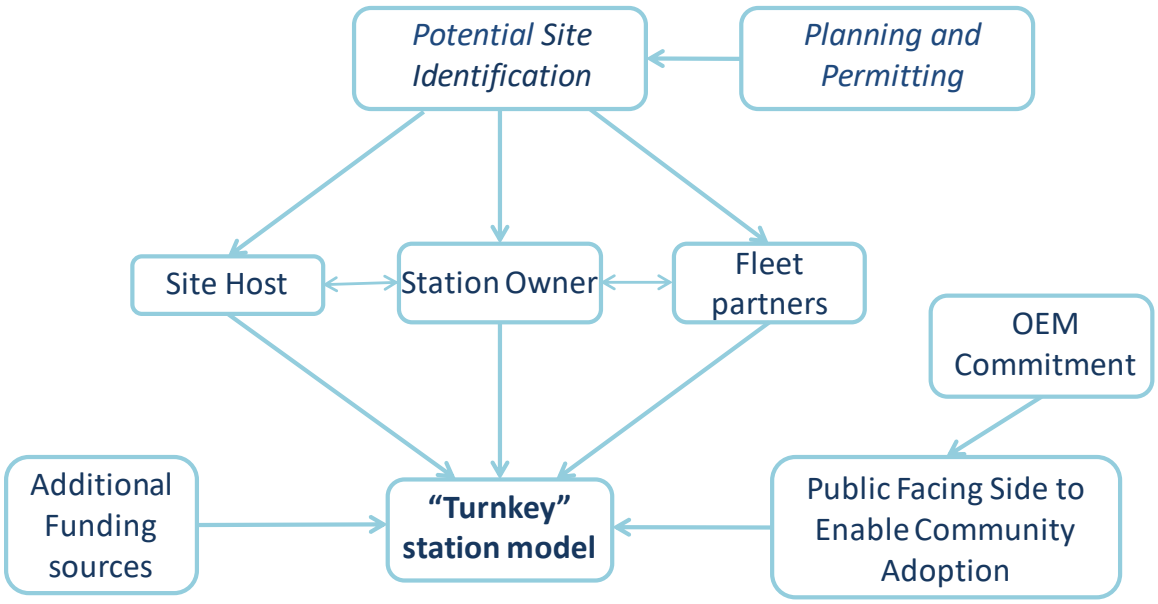
This report documents the results of the first step and includes information regarding specific locations identified in the *Site Readiness Report*.

The stakeholder outreach effort focused on the Eureka and Redding areas which were identified as the key phase 1 anchor locations in Task 2.1 of this project. The focus was to identify key partnerships rather than specific locations, as the partnerships are more critical for getting the first anchor stations funded and installed. As shown in Figure 1, these partnerships include the:

- Site host, which could also be the station owner;
- Station owner, which could also be the site host;
- Committed local fleet demand;
- Engagement by automotive original equipment manufacturers (OEM) in discussions regarding the sale of FCEVs in the local region, and during station commissioning to ensure compliance with OEM fueling requirements.

The results presented in this report focus on engagement with permitting officials and fleet partners. Subsequent outreach, following the submission of this report, will center on potential site hosts, station owners, and station developers.

Figure 1: Conceptual Relationship of Key Stakeholders in Site Identification



Credit: *RCEA and SERC, 2017*

CHAPTER 2: Results of *Site Readiness Report*

The Task 2.4 Site Readiness Report is a first step in identifying potential locations for installing a hydrogen fueling station anchor site in the two focus regions. Particular emphasis was given to the cities of Eureka and Redding. Included in this report are:

- A detailed review of the current state of the art of commercial public hydrogen fueling stations in California;
- A review of the *National Fire Protection Association Hydrogen Technologies Code*, 2016 Edition;
- Recommended station designs and features that consider anticipated regional demand and hydrogen sourcing constraints, and associated space and setback requirements; and
- A list of pre-screened potential locations that could host a station.

The information in the *Site Readiness Report* is intended to identify viable development projects in the region and help attract private and/or public investment. It is also intended to inform key stakeholders such as permitting officials and fire marshals to streamline early station development discussions with the relevant agencies holding jurisdiction.

It is worth noting that there is hydrogen fueling station located on the Humboldt State University campus in Arcata, which is located 6 miles to the north of Eureka. This site was considered for inclusion in micrositing efforts, but ultimately deemed infeasible due to numerous reasons. Please see APPENDIX E for a memo which contains a detailed assessment of the HSU station.

The following steps were used to identify the most appropriate station designs for Eureka and Redding:

1. Determine the station classification.
2. Identify the capacity and performance capabilities as recommended by CARB.
3. Determine the most appropriate source(s) of hydrogen given the station location relative to a hydrogen production facility.
4. Identify the station design options from the reference or retail station design that are reasonable for the area.

With these steps, recommendations were developed for the Eureka and Redding areas. Top potential sites in each area were then preliminarily identified using Google Earth and the following set of initial criteria:

- Sufficient Space for Delivered H2: for a site to accommodate a station that receives delivered gas, it must have an open area with dimensions of at least 15’

x 45’ or 29’ x 31’ for the hydrogen equipment. It is assumed that additional space will be available for the dispensing and electrical equipment. Note that these dimensions do not address NFPA or electrical classification requirements.

- Sufficient Space for On-site Generation: for a site to accommodate a station that generates gas on-site, it must have an open area with dimensions of at least 19’ x 75’. It is assumed that additional space will be available for the dispensing and electrical equipment. Note that these dimensions do not address NFPA or electrical classification requirements.
- Proximity: an ideal site will be in close proximity to major regional highways and/or high-use traffic routes within city limits.
- Accessibility: sites must have convenient access to and from the site based on traffic patterns and, in the case of delivered hydrogen, they must have sufficient space for a gas delivery truck to navigate the site safely.
- Visibility: ideal sites are located along high-use traffic routes.

In addition, the initial siting focused on Priority Zones identified in the Task 2.1 report. These are shown as the hashed areas in Figure 2 and Figure 3. Note that the owners of the properties listed were not contacted to gauge interest in potentially hosting a fueling station, but the project team intends to initiate contact after submitting this report and will detail results in the final report.

Results of these initial siting efforts are described in the following sections. These results are pulled from the Task 2.4 *Site Readiness Report*.

Eureka Station Design Recommendations

According to the CARB station classifications, Eureka would be classified as an **intermittent destination station**. Due to Eureka’s remoteness, relatively low population, and distance from the established fueling network, total utilization will be low until the statewide fueling network and vehicle penetration is well established. Recommended capacity and performance capabilities for an intermittent destination station are 200+ kg/day capacity and a single fueling position[2] (California Air Resources Board, 2017).

One of the main challenges in designing a fueling station in Eureka is determining the source of hydrogen. For the **centrally produced and delivery** option, the closest hydrogen production facility is Air Products & Chemicals, Inc. located in Sacramento. With a one-way driving distance of 300 miles, tube-trailer deliveries of hydrogen will be time consuming and expensive.

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2 California Air Resources Board, 2017. 2017 Annual Evaluation of Fuel Cell Electric Vehicle Deployment and Hydrogen Fuel Station Network Development.

In addition to the long driving distance, there is a concern of reliable access to Eureka. Highway 101 and Highway 299 run through forested areas and sections of unstable mountain terrain that have a potential for wildfires in the summer months and landslides in the rainy, winter months that may result in road closures. In addition to the unreliable road conditions, there may be a concern with delivery truck size restrictions, although both routes have and are currently undergoing major road realignment to address this issue. The long distance and access issues make centrally produced and delivered gas from Sacramento a fuel reliability concern.

Given the delivery logistics and road access concerns for delivered hydrogen, **on-site hydrogen generation via electrolysis** should be considered as a viable option for sourcing hydrogen. It offers a more secure source of year-round fuel and as the market matures and utilization increases, gas deliveries would most likely not be able to keep up with local demand. On-site electrolysis is, however, more expensive both in terms of capital costs and the on-going production costs that will result in a high price per kg for fuel.

Preliminary discussions have occurred regarding the use of inexpensive Trinity County hydroelectric power to generate hydrogen via centralized industrial-scale electrolysis. This could provide a more local source of delivered hydrogen that may be more cost competitive. In addition, if there were any industrial source of hydrogen in Redding this may make centrally produced and delivered hydrogen more cost competitive for a Eureka station specifically, but also for stations in the project region generally. However, this does not solve the challenges associated with road closures on Highway 299.

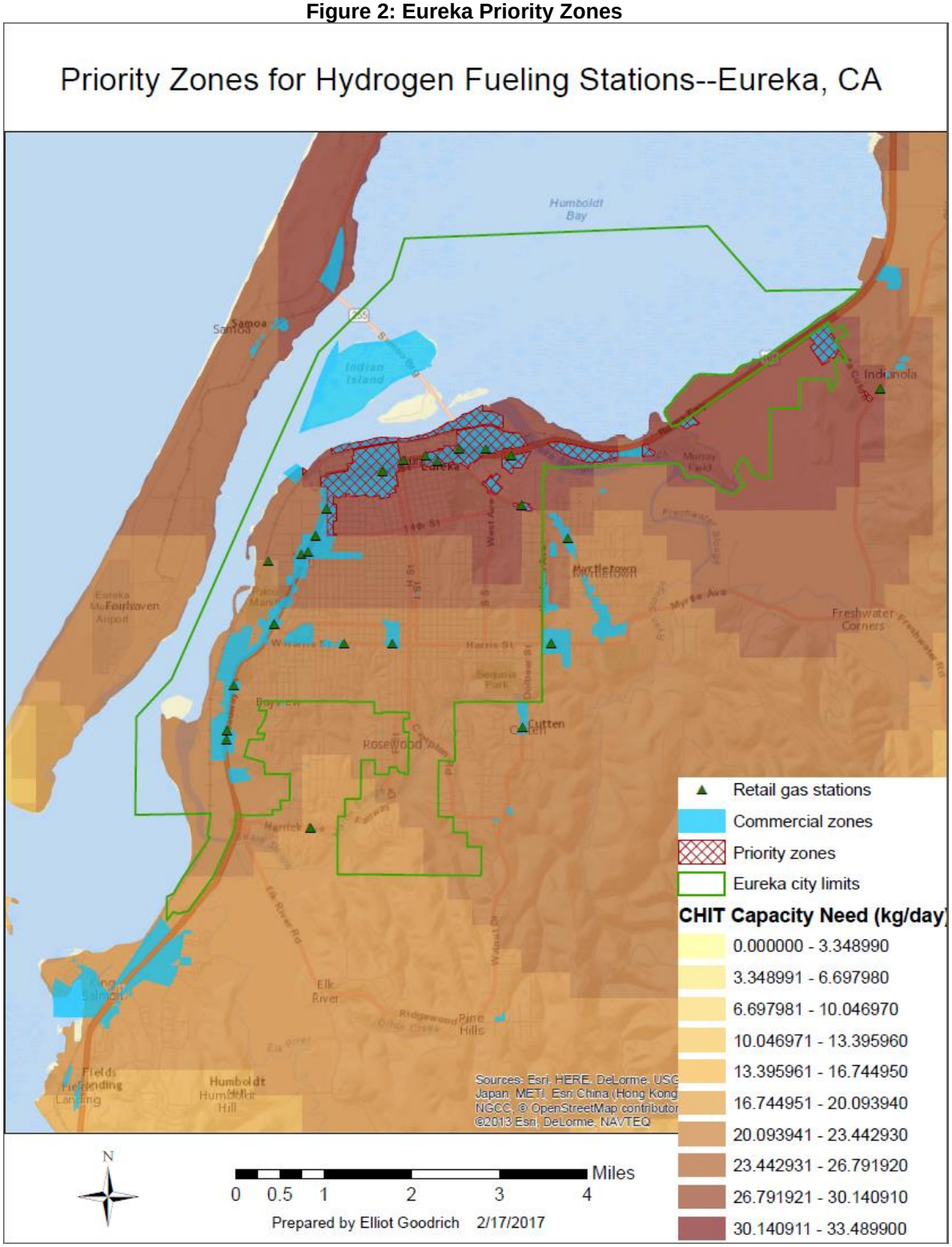
A review of the reference and retail station design options (see the *Task 2.4 Site Readiness Report*) identified two current retail station design options that are recommended for Eureka: a **modular 180 kg/day system with delivered gaseous system or a modular 130 kg/day system using on-site hydrogen production via electrolysis.** Although the capacity for each system is below the minimum 200 kg/day recommended by CARB, this is a future issue given the intermittent destination station classification and anticipated low utilization while the market matures.

Twelve top candidate sites were identified. These are shown in Table 1. A few observations for the top candidate sites:

- Three sites are gas stations located at the north end of Eureka: Shell Station-Myrtle, Humboldt Plaza Chevron, and Renner Petroleum-North.
- Three sites (Cash & Carry, Bracut Industrial Park, and Humboldt Plaza Private lot) are in a prime location on Highway 101 between Eureka and Arcata and have sufficient space to host an on-site generation station. The intersections for accessing the Cash & Carry and Bracut sites do not have traffic lights and there are safety concerns for crossing traffic. CalTrans has plans to address the various ingress and egress points along the safety corridor. Further investigation into the plans is required.

- The two commercial sites (Pacific Outfitters and Target) may have some compatibility challenges with the existing business traffic and dispensing hydrogen.
- Shell/Pacific Pride and Broadway Gas - 76 stations have available open space and offer good visibility, but are located outside the priority zones.
- Renner Petroleum – South is not centrally located and has limited open space, however the owner may be interested in hosting a station.
- The W. 7th & Summer St. open lot has some unknowns regarding site selection criteria, but owner engagement should occur before screening out this site.

Figure 2: Eureka Priority Zones



Credit: *Redwood Coast Energy Authority, 2017*

Table 1: Top Candidate Sites for Eureka

Business	*Type*	*Priority Zone*	*Space for Delivered Gas*	*Space for Onsite Generation*	*Comments/Concerns*
Shell Station - Myrtle	gas station	yes	yes	no	<1 mile south of Hwy 101 at the north end of Eureka
Humboldt Plaza Chevron	gas station	yes	possibly	no	Good location, sewer access issues
Renner Petroleum Eureka North	gas station	yes	possibly	no	Possible interested host, storm drain access issues
Cash & Carry	commercial	yes	yes	yes	Ideal location, poor ingress/egress from hwy
Bracut Industrial Park	commercial	yes	yes	yes	Ideal location, poor ingress/egress from hwy
Pacific Outfitters	commercial	yes	yes	no	Good visibility, potential parking loss
Target	commercial	yes	yes	yes	Difficult to work with large corporation
Humboldt Plaza Lot	parking lot	yes	yes	yes	Large private lot, secluded location
Shell/Pacific Pride	gas station	no	yes	no	Sufficient space, outside of priority zone
Broadway Gas 76	gas station	no	yes	no	Open space, outside of priority zone
Renner Petroleum Eureka South	gas station	no	possibly	no	Limited space, possible interested party
Undeveloped at W. 7th & Summer St	empty lot	no	yes	no	Outside of priority zone, ingress and egress concerns
Renner Arcata	gas station	no	possibly	possibly	Constrained space, possible storm drainage issues
Renner McKinleyville	gas station	no	possibly	possibly	Excellent space if open lot is developable; otherwise space constrained. Long distance for Eureka and Arcata drivers

Credit: *SERC, 2018*

Redding Station Design Recommendations

Given its relatively low population compared to the other core market areas, a station in Redding would be classified as an **intermittent destination station**. Although no current fueling network beyond state lines exists at present, it is an ideal location to provide future connectivity between California and Oregon.

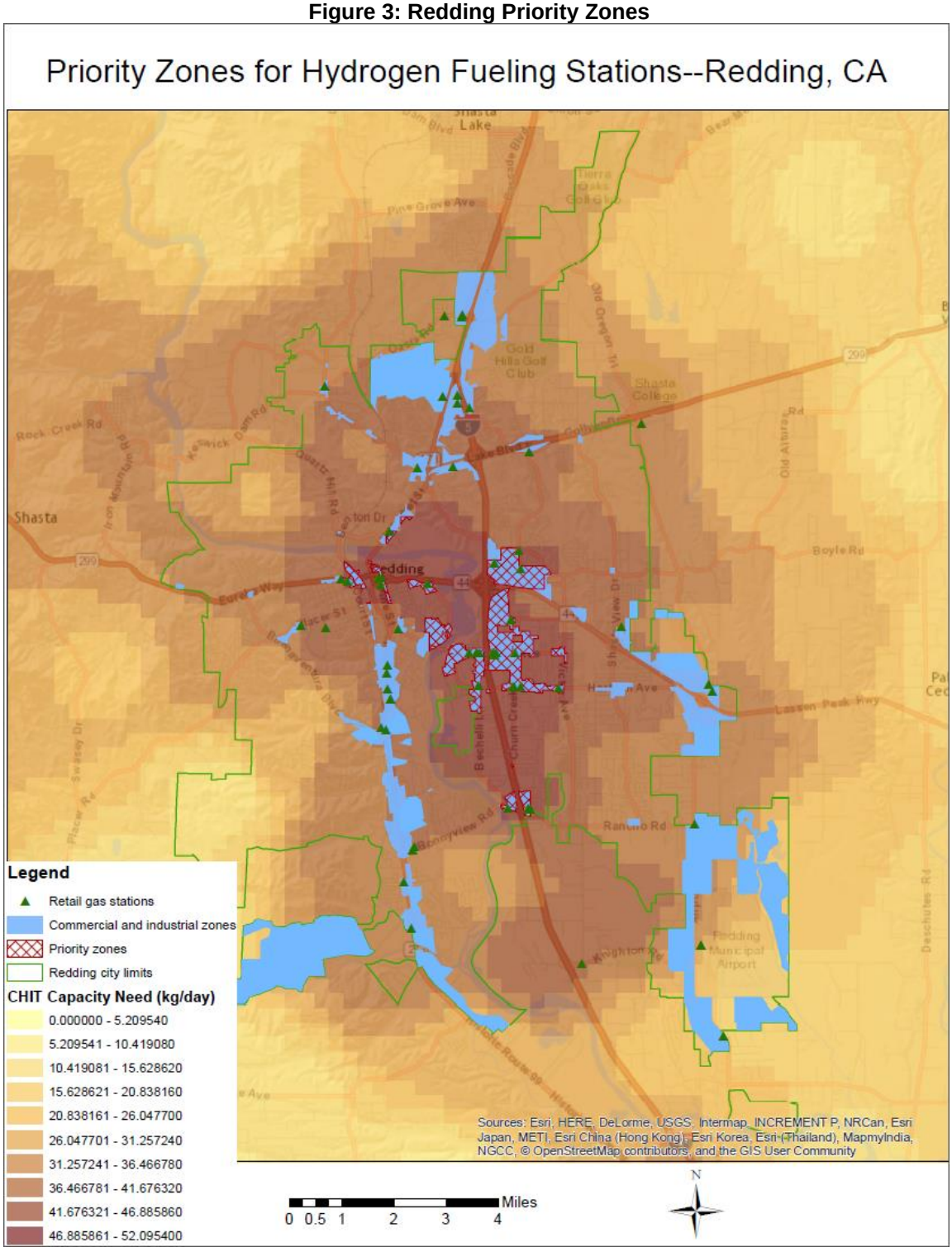
Centrally produced and delivered gaseous hydrogen is the obvious choice for fuel supply to a station in Redding. Air Products & Chemicals, Inc., located in Sacramento, is 175 miles due south on Interstate 5, a driving time of a little over 3 hours.

Given its anticipated low utilization and somewhat close proximity to a gas supplier, a **modular 180 kg/day system with delivered gaseous system** is the recommended option for the first hydrogen refueling station in Redding.

Twelve top candidate sites were identified. These are shown in Table 2. A few observations from the screening process:

- All of the sites have sufficient space to site the hydrogen equipment, however, 7 of the 10 sites are space-limited and may not meet the full lot line separation distance requirement. Authorization by the Authority Having Jurisdiction (AHJ) would be needed to reduce this distance to make installation possible.
- All of the sites have adequate to good visibility and are in close proximity to major highways.
- The available lots in the region identified as the priority zone are generally space constrained as the area has a relatively high density of built infrastructure. The limited available space and potential loss of parking spaces may be the most common reason for disinterest among potential hydrogen station site hosts Looking outside the priority zone may reveal many more options since the density of built infrastructure is lower.

Figure 3: Redding Priority Zones



Credit: *Redwood Coast Energy Authority, 2017*

Table 2:Top Candidate Sites Within the Priority Zone for Redding

Site #	*Business*	*Space for Delivered Gas*	*Proximity*	*Accessibility*	*Visibility*	*Comments Potential Concerns*
1	Hilltop Food & Fuel	yes	at I-5 exit	limited space for hydrogen delivery	good	Limited space; lot line separation issue and loss of parking
2	Arco Am/Pm #83205	yes	0.7 miles from I-5 exit	okay	okay	Limited space - lot line separation issue loss of parking
3	Tesoro #68192	yes	0.2 miles from I-5 exit	limited space for hydrogen delivery	good	Limited space - lot line separation issue loss of parking obstruction of traffic
4	Ball Park 76	yes	1 mile from I-5 exit	okay	okay	Limited space - lot line separation issue loss of parking
5	Colonial Energy Ce 20110	yes	2 miles from I-5 exit	okay	good	Open space
6	Churn Creek Chevron	yes	at I-5 exit	okay	good	Open space
7	Turtle Bay Mini Mart	yes	at Hwy 44 exit 2 miles from I-5	yes	okay	Sufficient space, good location
8	Tesoro #68194	yes	1 mile from I-5 exit	yes	okay	Limited space - lot line separation issue loss of parking
9	Speedy Valero at 2026 Eureka Way	yes	on Hwy 299 < 3 miles from I-5	limited space for hydrogen delivery	good	Limited space - lot line separation issue loss of parking interference with handicap route
10	Chevron at 1650 Hilltop	yes	at I-5 exit	okay	good	Limited space - lot line separation issue loss of parking incompatible with adjacent motel

Credit: *SERC, 2018*

CHAPTER 3: Public Request for Information

A public Request for Information (APPENDIX B) was released and disseminated by multiple project partners throughout the project region in April 2018. The goal of this Request for Information (RFI) was to solicit information and interest from potential stakeholders that the project had not already considered or reached out to. The initial intention was to only disseminate the RFI in the anchor site jurisdictions, but the project team decided it would be prudent to disseminate in all jurisdictions, even if no response was garnered. There was minimal response and few actionable items that came out of the effort.

Dissemination

The following project partners disseminated the RFI through links on websites, and word of mouth via phone and email. The only project partner unable to disseminate the RFI was the Glenn County Air Pollution Control District due to limited staff availability.

- Redwood Coast Energy Authority
- North Coast Unified Air Quality Management District
- Glenn County Air Pollution Control District
- Mendocino Council of Governments
- Siskiyou County Economic Development Council
- Shasta Regional Transportation Agency
- Tehama County Air Pollution Control District

Responses

Response received are as follows:

- Redding Electric Utility: they did not feel that supporting FCEV fueling infrastructure was within their business scope.
- CalTrans Division of Equipment: overall very interested in supporting the development of fueling infrastructure for light duty and heavy-duty FCEVs.
- Three members of the public in Mendocino County: two expressed concern that effort is being put into consideration of FCEVs, stating that battery electric vehicles are a better option. A third respondent connected us to a personal contact who works in in BMW's FCEV department; the BMW staff member expressed interest in providing additional information about the technology for our program's purposes.

Full responses are included in APPENDIX C.

Follow Up

No specific follow up was requested from those who responded to the RFI, but the project team recommends the following as prudent next steps:

- Once planning for a Redding station is in a more mature phase, contact the Redding Utility District to clarify the potential role they can play as a stakeholder.
- Coordinate between MCOG, Caltrans, and SERC to continue discussions with Caltrans. Caltrans responded directly to MCOG, and did not appear to realize the RFI was associated with the North Coast and Upstate Fuel Cell Vehicle Readiness Project.
- Contact the two members of the public directing them to the FCEV FAQ provided on the RCEA website.
- Coordinate with MCOG and SERC to determine appropriate follow-up with the BMW staff member.

CHAPTER 4: Engagement with City Officials

The project team met with planning officials from the Cities of Eureka and Redding. These meetings were intended to inform each jurisdiction about the status of hydrogen infrastructure in the State of California, the status of this project, and the findings of the Task 2.4 *Site Readiness Report*. These meetings were also intended to receive input from each jurisdiction regarding planning or permitting needs, and preferences for the location of hydrogen fueling stations. The following sections summarize the input received.

City of Eureka

The project team met with planning officials from the City of Eureka on May 1st, 2018. The City indicated they do not have any specific questions or needs regarding planning for permitting hydrogen fueling stations at this time. They also indicated there is strong support from the City Council and the City of Eureka General Plan for FCEVs.

The City indicated the following preferences and recommendations regarding the location of hydrogen fueling stations:

1. Do not want to see fueling stations on properties on or near the waterfront near Old Town, even if the property is zoned commercial or industrial.
2. Do not want to see a fueling station at the Myrtle Avenue Shell station. They believe the Shell station at the south end of Eureka is ideal.
3. Do want to see an electric and/or hydrogen fueling at the City-owned parking lot at 3rd and G streets. They are willing to designate up to one full aisle (both sides) of parking.
4. Any properties being considered on 4th or 5th streets need to consult CalTrans for right-of-way.
5. Any corridor that experiences more than 50 trips per day would trigger a traffic study.
6. Recommend determining whether potential sites in the coastal zone have precedent for development permit; any property located east of Myrtle Ave. requires a coastal permit.
7. Additional potential sites include:
    a. Target
        i. Target is currently thinking of ways to utilize their underutilized parking lot. They have too much space, and their parking significantly exceeds their permit requirements
    b. Pacific Outfitters

i. Pacific Outfitters is in the process of purchasing the corner property on 5th and Myrtle from the City of Eureka. Pacific Outfitters might be interested in hosting a station, although ingress/egress may be an issue.

c. Bayshore Mall
    i. The far north parking area at the Bayshore Mall is underutilized.
d. Cash-and-Carry
    i. The store location is within Eureka City limits and would be ideal for development,
e. Harvey Harper Motor World car dealership
    i. Parcels near this property should be considered.
f. Brainard Mill Property
g. This property is currently being annexed into City limits. This may also be a potential location.
h. Broadway Ave.
    i. Any location along this heavily-used street should be considered.
    ii. Specific site suggestions include:
        1. Abandoned K-Mart parcels
        2. 76 gas station
i. Renner Petroleum
j. The Eureka property may not be ideal due to space constraints, but other Renner Petroleum sites in McKinleyville and Arcata should be considered.

City of Redding

The project team held a remote conference call with planning officials from the City of Redding on May 2nd, 2018. The City indicated they do not have any specific questions or needs regarding planning for or permitting hydrogen fueling stations at this time and stated that they would treat permitting for hydrogen stations the same as any conventional gas station because both fuels have the same safety ratings.

The City indicated the following preferences and recommendations regarding the location of hydrogen fueling stations:

1. Hilltop Drive and Churn Creek Road areas
    a. The City expressed a strong interest and recommendation in locating a fueling station in this area due to centrality and accessibility.
2. Mt. Shasta Mall
    a. The City recommended this location since it is currently undergoing a redevelopment plan. This may be a good time to inquire about potential interest.

3. Ross Shopping Center on E. Cypress Ave
    a. This location has a large, underutilized parking area
4. Turncreek Chevron
    a. The City expressed strong support for this location because it is a site with high visibility.
5. Turtle Bay
    a. The City noted that this site does not have great visibility from I-5.

The City also made the following comments regarding station design and stakeholder outreach:

1. For gasoline stations, they have a different lot-line setback requirement for the lot edge that is parallel vs. perpendicular to the pump.
2. They were interested in available resources on station design and permitting.
3. For signage, the City of Redding has stricter regulations than other regions due to their status as an MPO. Redding's freeway signs are required to be smaller than most.
4. Upon approaching potential site hosts, be prepared with information from past California Energy Commission grants to inform hosts of the financial investment they will need to make, if any.

CHAPTER 5: Engagement with Fleets and Fuel Suppliers

Executive Order B-16-2012 requires that "California's state vehicle fleet increase the number of its zero-emission vehicles through the normal course of fleet replacement so that … at least 25 percent of fleet purchases of light-duty vehicles be zero-emission by 2020." Furthermore, Governor Brown released the *2016 ZEV Action Plan* which provided additional guidance and specific actions to the Department of General Services and CalTrans. Related actions include;

- "Evaluate potential for state-owned land to provide no-cost leasing options for public transit agencies or fleets to build charging or fueling infrastructure." (CalTrans and DGS Lead)
- "Support development of key infrastructure projects that will help enable adoption and operation of zero-emission technologies along major freight corridors, at the ports of Los Angeles, Long Beach and Oakland, at freight distribution centers and hubs and as part of connected vehicle transportation systems." (CalTrans Lead)
- "Establish new goals for state fleet ZEV purchases so that 50% of annual light duty fleet purchases are ZEV by 2025." (DGS Lead)
- "Support state agencies in their efforts to implement infrastructure plans enabling increased use of ZEVs." (DGS Lead)

In response to these calls by the Governor's Office:

- CalTrans developed:
    - a roadmap for addressing B-16-2012 (2015)[3]
    - a sustainability action plan (2016)[4]
    - commitments to ZEV fueling infrastructure in the most recent 2-Year Plan (December, 2016)[5]
- DGS released Management Memo 16-07[6] which directs state agencies to:
    - expand ZEV purchasing such that "light-duty fleet acquisitions will … meet or exceed 50% ZEVs on an annual basis …" by fiscal year 2024 / 2025, and
    - "submit to the … DGS … a Five-Year ZEV Infrastructure Readiness Survey."

In this context, SERC engaged with CalTrans Department of Equipment (DOE) and local Caltrans District offices regarding the potential for CalTrans FCEV fleet demand in the

3 http://www.dot.ca.gov/hq/sustainability/documents/Executive_Order_B-18_B16_Roadmap_with_Appendix.pdf

4http://www.dot.ca.gov/sustainability/docs/2016_Sustainability_Implementation_Action_Plan_First_Ed_092016.pdf

5 http://www.dot.ca.gov/hq/transprog/map21/implementation/ct-2-year-action-plan-final-121616.pdf

6 https://www.documents.dgs.ca.gov/osp/sam/mmemos/MM16_07.pdf

North State region. Fleet commitment is a critical piece of the infrastructure planning effort. In this early market, government fleets are the most likely source of a dependable fuel demand as the timeline for public adoption is farther in the future compared to more urban areas of the State.

Discussions with CalTrans

The following summarizes this engagement. Additional details and supporting materials are included in APPENDIX A:.

- December 15th, 2016: SERC attended a conference call organized by Caltrans which included CalTrans staff from DOE, Department of Maintenance, Division of Research Innovation and System Information, Department of Sustainability, and the District 2 office. The goal of this meeting was to discuss the potential use of the Humboldt State University hydrogen fueling station for District 1 if FCEVs were to be placed in that district. SERC gave a presentation on the North Coast and Upstate Fuel Cell Electric Vehicle Readiness Project, and provided a handout of all recent ZEV planning efforts in the North State region to date. The minutes of the meeting are included in APPENDIX A.
- December 21st, 2016: SERC attended a follow up meeting with additional attendees, including staff from District 1. SERC presented a white paper (see APPENDIX D) on the status of the HSU fueling station, and recommended research and infrastructure needs in the North State region. It was determined that District 1 is not interested in locating a publically accessible fueling station on CalTrans property. Their preference is to see private development and District 1 would commit fleet demand. This was the sentiment of District 2 as well.
- January 12th, 2017: SERC attended a follow up meeting that was attended by CalTrans staff from Department of Equipment Planning, Department of Project Management, District 1, and District 6. Resulting action items involved a plan for CalTrans to submit a white paper to CEC regarding ideas to collaborate on fueling infrastructure targets. It is unknown if this was followed through with. Other action items were not completed.

Since the last meeting, there were two efforts by District 1 to identify potential funding sources that could catalyze fueling infrastructure development. These were the pursuit of:

- CalTrans Division of State Planning and Research (SPR) Special Studies
- Senate Bill 1 planning grant

Neither effort was successful. No other follow up regarding this collaboration has occurred to date.

Furthermore, CalTrans DOE responded to the Request For Information released by RCEA for this project. Their response is discussed in 0.

CHAPTER 6: Engagement with Other State, Industry, and Public Stakeholders

The project team has engaged with a number of other stakeholders (in addition to those mentioned in previous sections) regarding fueling infrastructure development and promotion of FCEVs. The following is a summary of these efforts in chronological order.

- August 2015 – May 2016: The project team engaged with the University of California Advanced Power and Energy Program to leverage their Spatially & Temporally Resolved Energy & Environment Tool (STREET) to model higher resolution hydrogen demand estimates than were currently available.
- December 2016 – January 2017: SERC engaged with CalTrans Department of Equipment and local Districts 1 and 2 regarding potential hydrogen fleet commitments and interest in hosting hydrogen fueling infrastructure. See Chapter 5 above for details.
- February 2017: RCEA connected Trinity Public Utility District (TUPD) with FirstElement Fuels regarding a hydrogen production concept using low cost and low carbon hydroelectric power from TPUD. It is unknown if this effort stalled or continued forward. It is possible that TPUD and FirstElement continued discussions without the involvement of the project team.
- February 2017: SERC met with CalTrans District 1 to discuss potential funding sources for a fueling station in the Eureka area. The following action items from this meeting were developed but not completed:
    - District 1 will:
        - provide a 5-10 year projection of hydrogen fleet vehicle count and associated annual VMT assuming fuel is available in Eureka. This will be done assuming 1 kg of hydrogen is roughly equal to 1 gallon of gasoline, and the efficiency of an FCEV is 60 miles per kg of hydrogen.
        - Develop a letter of support using the above estimates that documents committed fleet consumption should fuel become available in Eureka.
    - SERC will use the letter of commitment to engage with local fuel suppliers regarding interest in owning or hosting a fueling station.
- February, 2017: The project team provided an overview to CalTrans of all CEC-funded efforts to date related to hydrogen infrastructure development. This information was used by CalTrans Department of Equipment in the development of an internal fact sheet to inform their efforts on infrastructure development.
- March and August 2017: SERC collaborated with CalTrans District 1 on two potential fueling infrastructure design and capital funding opportunities. These

were CalTrans internal Special Studies funds, and CalTrans SB1 funding. Neither of these opportunities came to fruition.

- September 2017: SERC attended the California Hydrogen Business Council Summit in Sacramento. SERC obtained information and insight on station design trends, and recommendations on likelihood of State funding for the North State region in the near future.
- December 2017: The California Fuel Cell Partnership brainstormed a potential collaboration that would request State funding to improve the existing fueling stations at Humboldt State University and California State University Los Angeles. There was some momentum here regarding connecting HSU with CSU LA. However, this idea was cut short by the inability for CSU campuses to directly request State funding outside of the Chancellor's office. Additional campus politics hindered this idea.

APPENDIX A:
CalTrans Meeting Minutes

Potential District 1 Hydrogen Fueling Infrastructure Meeting Review

12/15/2016

Attendees

Lisa Kunzman, Caltrans Division of Equipment (DOE)
Ed Hardiman, Caltrans DOE
Robert Wedding, Caltrans DOE
Aaron Holcomb, Caltrans Maintenance
Patrick Tyner, Caltrans DRISI
Elias Kurani, Caltrans Sustainability
Trina Blanchette, Caltrans Transportation Planner District 2
Peter Lehman, SERC
Jerome Carman, SERC

Discussion Review:

Caltrans purchased 20 Toyota Mirai and has 11 more hydrogen vehicles planned for purchase.

Potential hydrogen fuel station locations in Redding and Ukiah.

Humboldt State University (HSU) has a hydrogen fueling station designed and maintained by Schatz Energy Research Center (SERC).

- The station was designed for fuel cell testing and research.
- The hydrogen vehicles have driven from District 1 to the bay area. The vehicles will need to refuel at a station in the bay area to make the return trip.
- 10Kg of storage. The Toyota Mirai has a 5 kg tank.
- The station is not SAE J2601 compliant[7].
- Toyota advising against fueling the Mirai at a station not compliant to SAE J2601.
- SERC advising against retrofitting the Humboldt State station; space is not ample, parking is limited and location is not ideal for traveling public.
- SERC recommends a full retail station.
- The Humboldt station would best serve as an interim fueling site while a full retail station is under construction.

Funding for a full retail station is approximately $2.5-3 million.

7 SAE J2601 classifies fueling performance. All stations now are designed and commissioned to SAE J2601 standards.

Caltrans and Toyota are exploring the use of the SimpleFuel station

Explore options for funding from California Energy Commission (CEC), Caltrans Sustainability, Caltrans Division of Research Innovation and System Information (DRISI), Air Districts, and Toyota.

Action Items

- SERC- written paragraphs to DRISI for potential research projects
- SERC- white paper for California Energy Commission
- DOE- contact Toyota for use of HSU station on an interim basis
- Send Patrick MM16-07 https://www.documents.dgs.ca.gov/osp/sam/mmemos/MM16_07.pdf.
- Robert Wedding set up phone conference next Wednesday with district representatives.

Follow Up: Potential District 1 Hydrogen Fueling Infrastructure Meeting Review
12/21/2016

Attendees:

Lisa Kunzman, Caltrans Division of Equipment (DOE)
Ed Hardiman, Caltrans DOE
Robert Wedding, Caltrans DOE
Aaron Holcomb, Caltrans Maintenance
Patrick Tyner, Caltrans DRISI
Elias Kurani, Caltrans Sustainability HQ
Brad Mettam, Caltrans Sustainability, D1
Jeff DeFevere, Caltrans
Scott Lezchuk, Caltrans
Don Anderson, Caltrans
Thomas Balkow, Caltrans
Rex Jackman, Caltrans
Robert Polyack, Caltrans
Peter Lehman, SERC
Jerome Carman, SERC

Action Items Completed from Last Meeting

- SERC- written paragraphs to DRISI for potential research projects
    - Completed, DRISI sees a potential research project opportunity for using interim fueling stations and locations of anchor stations .
- SERC- white paper for California Energy Commission
    - SERC has received funding for 10% station engineering design, have not received funding for station construction or purchase.
- DOE- contact Toyota for use of HSU station on an interim basis
    - Not completed for HSU station. Toyota has been introduced to Simple Fuel. Further examination of Mirai and Simple Fuel station compatibility is needed.
- Send Patrick Department of General Services Management Memo 16-07 https://www.documents.dgs.ca.gov/osp/sam/mmemos/MM16_07.pdf.
    - Completed.
- Robert Wedding set up phone conference next Wednesday with district representatives.
    - Completed.

Discussion Review:

- Potential for future CalTrans research project with the hydrogen station, e.g. impact of anchor stations in rural areas.
- Research is needed to find applications for CEC grant funding.

- SERC's CEC grant is for planning to the 10% design level, assuming a privately-owned site host.
- Air Resources board should have information for Volkswagen consent decree funding for maintenance and repair of hydrogen station.[8]
- Caltrans Division of Equipment is not interested in owning a full retail station. Caltrans yard not an ideal location because they are locked up at night which results in limited public use.
- Caltrans HQ has worked on a plan for 3 retail stations and 1 rest stop location.
- D1 question: Where is the break-even point for the retail hydrogen station?
- Look into joint projects with other states. Need to verify project names, but projects known to date are the West Coast Electric Fleets joint venture by Oregon, Washington and California. Multi States 8-9 states from east and west coasts.
- Study growth rate for public vs. private hydrogen stations.
- Talk to Capital Outlay Planning for support of a project initiation document (PID).
- Find SERC needs for PID project work w/ D1, D2 and D6.
- Contact Jim Davis for fuel cell stations.

New Action Items

- SERC looking to find suitable locations for planning.
- Elias to talk with HQ planning to find out how to determine Expenditure Authorization (EA).[9]
- SERC to set up meeting with CEC to deliver white paper, DOE and Elias will join.
- Set up meeting for second week of January.[10]

8 CARB released VW Mitigation Plan in June 2018. This Plan has allocated $5 million to hydrogen fueling infrastructure development.

9 No outcome known to date.

10 At present, this white paper has not been published to the best of authors' knowledge.

Follow Up: Potential District 1 Hydrogen Fueling Infrastructure Meeting Review

1/12/2017

Attendees:

Lisa Kunzman, Caltrans Division of Equipment (DOE)
Ed Hardiman, Caltrans DOE
Robert Wedding, Caltrans DOE
Brad Mettam, Caltrans Sustainability, District 1 (D1)
Harpreet Binning, Caltrans, District 6 (D2)
Thomas Balkow, Caltrans Planning
Phil Baker, Caltrans Project Management
Peter Lehman, SERC
Jerome Carman, SERC
Jim Zoellick, SERC
Gregory Chapman, SERC

Action Items

- SERC looking to find suitable locations for planning.
  - Not completed
- Elias to talk with HQ planning to find out how to determine Expenditure Authorization (EA).
  - Not Completed.
- SERC to set up meeting with CEC to deliver white paper, DOE and Elias will join.
  - Not completed. SERC recommends making Caltrans the author of draft rather than a SERC paper.
- Set up meeting for second week of January.
  - Completed.

Discussion Review

- A Caltrans PID is required to obtain funding from Caltrans.
- PID in D6 for hydrogens stations has been started. Locations in the district are state rest areas and private locations like truck stops. The most suitable locations are those with 24/7 amenities.
- Most non-maintenance vehicles use retail fueling sites.

Action Items

- SERC looking to find suitable locations for planning.
- Elias to talk with HQ planning to find out how to determine Expenditure Authorization (EA).
- Caltrans to author a white paper to the CEC.
- DOE--Contact Elias for information on how and who should start a PID.
- DOE –Contact Harpreet and obtain a copy of D-6 PID, this is scheduled for March.
- Create new meeting in middle of February.

APPENDIX B: Public Request for Information

The full request for information is included in the following pages.

REQUEST FOR INFORMATION

REGARDING INTEREST IN FUEL CELL ELECTRIC VEHICLE INFRASTRUCTURE PLANNING AND SITES

FOR LOCAL HYDROGEN FUELING STATION PROJECTS

March 30, 2018

Introduction

The Redwood Coast Energy Authority ("RCEA") is issuing this Request for Information ("RFI") to solicit responses from public and private entities in or around the North State California Region – consisting of the Shasta, Del Norte, Trinity, Mendocino, Siskiyou, Tehama, Glenn, and Humboldt Counties – regarding interest in fuel cell electric vehicle ("FCEV") planning, hydrogen production, hydrogen fuel-cell vehicle adoption, and property owners and/or fuel distributors interested in hosting, leasing, or owning hydrogen fueling infrastructure.

This RFI is intended solely to obtain information to assist with the ongoing assessment of possible project sites as well as further analysis of FCEV market development, local hydrogen production, and planning efforts.

This RFI is an inquiry only and is meant to help the project team better understand the communities' need or interest in FCEVs and related infrastructure. This RFI is not a contract or agreement nor does it represent a commitment to negotiate with any individual, organization, land owner, issue a Request for Qualifications, or issue a Request for Proposals in the future. Those choosing to respond to this RFI will not, merely by virtue of submitting such a response, be deemed to be "bidders" on any future projects in any sense, and no such respondent will have any preference, special designation, advantage or disadvantage whatsoever in any subsequent activities related to any future projects. The information contained in the responses to this RFI will, however, help the project team to advance evaluation and development efforts for local hydrogen fueling stations, hydrogen production, and FCEV planning activities which may result in the launch of future FCEV planning, a formal project and associated negotiations and procurement activities.

Background

RCEA is a local government Joint Powers Authority (JPA) located in Humboldt County that develops and implements sustainable energy initiatives in the North Coast and Upstate regions. RCEA implements Humboldt County's Community Choice Energy program, offers energy efficiency services for homes, businesses, and schools, and implements programs that facilitate regional adoption of zero emission vehicles, including FCEVS, and associated infrastructure development.

Currently, RCEA is working with the following project partners to implement the North Coast and Upstate Fuel Cell Vehicle Readiness Project:

- Shasta Regional Transportation Agency (SRTA)
- Mendocino Council of Governments (MCOG)

- North Coast Unified Air Quality Management District (NCUAQMD)
- Glenn County Air Pollution Control District (GCAPCD)
- Tehama County Air Pollution Control District (TCAPCD)
- Siskiyou Economic Development Council (SEDC)

Figure 1 Project Region

The North Coast and Upstate regions comprise over 17% of the land area of the State and include several key transportation corridors including Highway 101, Interstate 5, and State Route 299. These three arteries carry the vast majority of road travel between California and destinations in Oregon and Washington. FCEVs are a critical long-term solution for sustainable transportation objectives.[1]

The goal of the North Coast and Upstate Fuel Cell Vehicle Readiness Project is to create a coordinated effort throughout the 8-county North Coast and Upstate regions to support the successful introduction of FCEVs, plan for the wise and effective deployment of hydrogen fueling infrastructure, and help catalyze a robust regional market for FCEVs. The project team has completed a Regional Hydrogen Infrastructure Plan, and is now identifying and evaluating sites for future hydrogen fueling stations, as well as promoting the incorporation of FCEVs into municipal fleets.

In pursuit of these objectives, RCEA seeks to gather input from various parties, including but not limited to:

- Potential land-owners and business-owners interested in learning about hosting a hydrogen fueling station
- Local government planning officials interested in, or who have information relevant to, promoting FCEVS
- Fleet managers interested in, or who have information relevant to, incorporating FCEVs into their fleet
- Permitting officials interested in learning more about, or who have information relevant to, code requirements for hydrogen fueling stations
- Emergency first responders interested in learning more about, or who have information relevant to, training specific to FCEV safety codes
- Businesses interested in hydrogen production, vehicle sales, and fueling infrastructure
- Other parties generally interested in learning more about FCEV technology

This RFI is intended to assist RCEA and project partners in further promoting FCEV technology as well as identifying/evaluating possible sites in the North Coast and Upstate regions suitable for retail fueling stations which could be developed by RCEA and/or a third party.

[1] California Air Resources Board. January, 2018. California's Advanced Clean Cars Midterm Review.

Desired Site Characteristics and Information Requested

RCEA is requesting two types of information: site characteristics, and general interest information.

Desired Site Characteristics Requested

RCEA has identified site characteristics that could make a project desirable for station development. The characteristics include but are not limited to:

1. Located in the North Coast or Upstate regions, with particular interest in the Humboldt Bay area and Redding area.
2. Sufficient space for hydrogen fueling infrastructure. To assist the respondent, the following conceptual layouts are provided as an example[2]:
    a. Delivered H2: see Attachment A. At the least, additional space may be needed for ingress/egress for hydrogen delivery and customers.
    b. On-site Generation: see Attachment B. At the least, additional space may be needed for ingress/egress for hydrogen delivery and customers.
3. Proximity: an ideal site will be close to major regional highways and/or high-use traffic routes
4. Ingress / Egress: sites must have convenient access to and from the site based on traffic patterns, and in the case of delivered hydrogen, must have sufficient space for a gas delivery truck to navigate the site safely.
5. Visibility: ideal sites are located along high-use traffic routes.
6. Flat or gently sloped.
7. Appropriately zoned as commercial or for gas station development.

Interested parties are asked to address the above considerations in their responses and provide information that includes:

1. Respondent/property owner's name and contact information (phone, email, and mailing address).
2. Specific location of the property and size of the area available for potential fueling station development.
3. Current property zoning and any known use restrictions.
4. Physical description of the site (existing conditions, slope, access, etc).
5. Any other factors, advantages, or limitations that might be relevant to the viability of the site for hydrogen fueling infrastructure development.

Desired General Interest Information Requested

RCEA has identified the following information as valuable to local fuel cell electric vehicle planning, adoption, and infrastructure development:

1. Local government staff and elected representatives: description of interest in hydrogen fuel cell electric vehicles, specific plans and codes that have been adopted in relevant jurisdiction related to hydrogen fueling stations, interest in planning for zero emissions vehicles, and/or needs for addressing State hydrogen goals.

[2] Note that the conceptual layouts provided as Attachment A and Attachment B do not represent an approved or recommended design. They are provided solely to give respondents a rough idea of possible space requirements.

2. Fleet managers: description of interest in hydrogen fuel cell electric vehicles, interest in further discussing ways to incorporate fuel cell electric vehicles into local fleet, ongoing efforts to incorporate fuel cell electric vehicles into local fleet, and/or needs for addressing State hydrogen goals.
3. Emergency first responders: description of interest in emergency first responder training specific to fuel cell electric vehicle and fueling station safety, training/information that has been adopted in the local jurisdiction already, and/or needs for addressing State hydrogen goals.
4. Businesses, organizations, or individuals interested in investing in hydrogen production, investing in hydrogen fueling station development, and/or developing the local market for hydrogen fuel cell electric vehicles
5. Vehicle dealerships interested in understanding hydrogen fuel cell electric vehicles

Interested parties are asked to address the above considerations in their responses and provide information that includes:

1. Respondent/organization's name and contact information (phone, email, and mailing address).
2. Information, if available, on relevant past projects, potential project timelines, funding amounts, and location.
3. Any other factors, advantages, or limitations that might be relevant to the viability of regional development of a fuel cell electric vehicle market and associated infrastructure.

Responses should be directed via email to Aisha Cissna, RCEA Transportation Specialist, at acissna@redwoodenergy.org

Responses will be accepted on an on-going basis at least through April 30, 2018; this period may be extended by RCEA at its sole discretion. Responses should include the phrase "RCEA Request for Information - FCEV Readiness RFI" clearly indicated in the subject line of the e-mail accompanying the response.

Upon receiving a response, RCEA will initiate a review and may contact the respondents to follow up with additional questions and clarifications or to offer to conduct one-on-one meetings with some or all of the respondents. The opportunity to participate in such meetings, if any, will be communicated separately to individual respondents. The respondent is not obligated to meet if contacted.

Public Nature of Responses

All responses to this RFI, including responses, pre-submittal and post-submittal communications with RCEA, will become the exclusive property of RCEA. Responses and communications with RCEA are subject to disclosure in accordance with the California Public Records Act (Cal. Government Code section 6250 et seq.). Respondents should not submit any information or documents that they consider proprietary and that they would not want publicly disclosed.

If there is information you wish to provide that you believe would be critically important to the evaluation of the site and that you believe would be exempt from disclosure under the Public Records Act, prior to submitting any such information you should contact RCEA to discuss and evaluate the matter further.

By submitting a response, respondent agree to hold harmless and not seek damages against RCEA, its officers, employees and agents, or any member government or recovery of its attorneys' fees as a result of any dispute related to the release or withholding of information submitted in response to this RFI.

Participant Feedback

RCEA welcomes feedback on the process of evaluating local hydrogen fueling station projects. Please ask any questions that you or your organization deem relevant. Thank you in advance for your participation.

All communications, questions, and responses associated with this RFI should be addressed to:

Aisha Cissna

Transportation Specialist

Redwood Coast Energy Authority

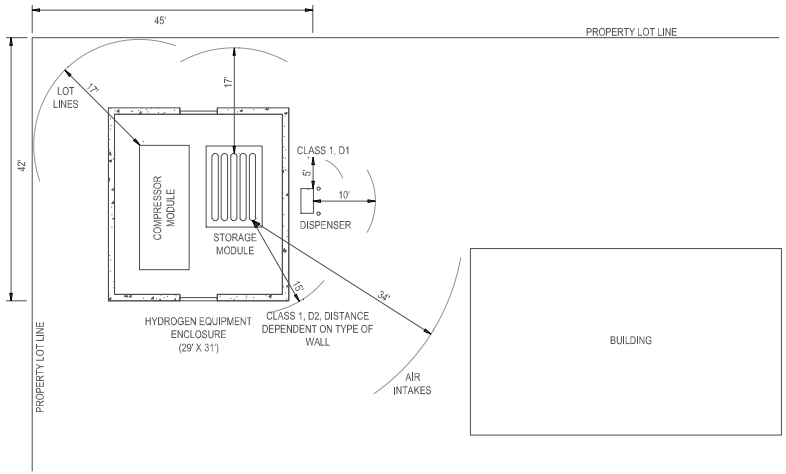
633 3rd Street Eureka, CA 95501

707-269-1700

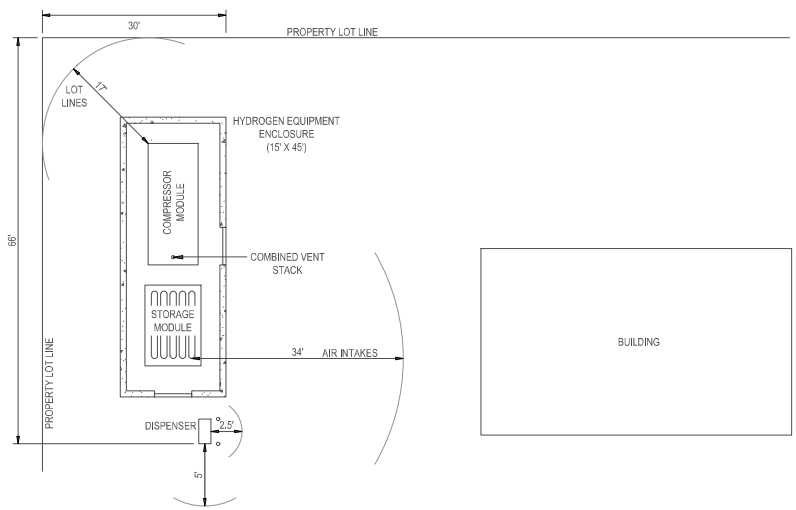
acissna@redwoodenergy.org

Figure 12: Design Option 1 - Modular Station with Gas Delivery

DRAWING 1:GAS-DELIVERED STATION WITH PARALLEL CONFIGURATION
OVERALL SPACE REQUIREMENT OF 42' X 45' INCLUDING THE DISPENSER



DRAWING 2: GAS-DELIVERED STATION WITH LINEAR CONFIGURATION
OVERALL SPACE REQUIREMENT OF 30' X 66' INCLUDING THE DISPENSER



DESIGN NOTES

IN THESE TWO LAYOUTS THE LOT LINE SETBACKS ARE IMPLEMENTED TO PROVIDE A CONSERVATIVE APPROACH FOR ESTIMATING THE TOTAL OPEN SPACE REQUIRED TO INSTALL THIS TYPE OF STATION. MODIFICATIONS TO ANY SETBACKS ARE AT THE DISCRETION OF THE AUTHORITY HAVING JURISDICTION (AHJ) AND IF IMPLEMENTED, MAY MAKE A SPACE-CONTRAINED SITE VIABLE FOR HYDROGEN INTEGRATION.

A SITE EVALUATION WILL BE REQUIRED TO DETERMINE HOW THE 34' AIR INTAKE DISTANCE AFFECTS THE REQUIRED SPACE.

- THIS ANALYSIS IS A HIGH-LEVEL LOOK AT CODE REQUIREMENTS, A MORE DETAILED INVESTIGATION BY A CODE EXPERT IS RECOMMENDED FOR SITE DESIGN
- ONLY CRITICAL NFPA 2 SEPARATION DISTANCES AND SOME ELECTRICAL AREA CLASSIFICATION DISTANCES ARE SHOWN
- ENCLOSURES ARE CONSTRUCTED OF NON-COMBUSTIBLE MATERIALS AND ARE DESIGNED TO PROVIDE ADEQUATE VENTILATION
- DISPENSER CAN BE SITED ADJACENT TO EITHER SIDE OF THE HYDROGEN EQUIPMENT ENCLOSURE OR REMOTELY AT A NEW DISPENSING LOCATION OR EXISTING GASOLINE DISPENSING ISLAND

SEPARATION DISTANCES FOR GASEOUS HYDROGEN SYSTEMS (NFPA 2, 2016)

- AIR INTAKES (HVAC AND COMPRESSORS, ETC.) 34'
- LOT LINES 17'
- OPERABLE OPENINGS IN BUILDINGS 17'
- PARKED CARS 8'
- BUILDINGS OF NONCOMBUSTIBLE OR COMBUSTIBLE MATERIALS, OVERHEAD UTILITIES 14'
- DISPENSER TO LOT LINE, IGNITION SOURCE, ETC. 10'
- APPROVAL AND MODIFICATIONS TO SETBACKS AT THE DISCRETION OF THE AUTHORITY HAVING JURISDICTION (AHJ)

ELECTRICAL AREA CLASSIFICATIONS - GH2 VEHICLE FUELING STATIONS (NFPA 2, 2016)

- ALL DISTANCES MEASURED SPHERICALLY FROM SOURCE POINT
- WITH STRATEGIC PLACEMENT AND HEIGHT OF THE RELIEF VALVE AND VENT STACK OUTLETS, THE ELECTRICAL CLASSIFICATION AREAS FROM THESE SOURCES SHOULD NOT EXTEND TO GROUND LEVEL OUTSIDE THE EQUIPMENT ENCLOSURE
- CLASS I, DIV. 1 WITHIN 5' OF DISPENSER ENCLOSURE
- CLASS I, DIV. 2 UP TO 15' FROM STORAGE EQUIPMENT, BUT SHALL NOT EXTEND PAST AN UNPIERCED WALL OR GASTIGHT PARTITION. ENCLOSURE DESIGN AND LOUVRE LOCATION(S) WILL DICTATE THE DIRECTION THIS ZONE EXTENDS.

SCHATZ ENERGY RESEARCH CENTER

HUMBOLDT STATE UNIVERSITY
Sponsored Programs Foundation

MODULAR HYDROGEN STATION - GAS DELIVERY - 180 KG/DAY

REFERENCE STATION DESIGN LAYOUTS FOR SPACE EVALUATION
FCEV HYDROGEN READINESS PROJECT

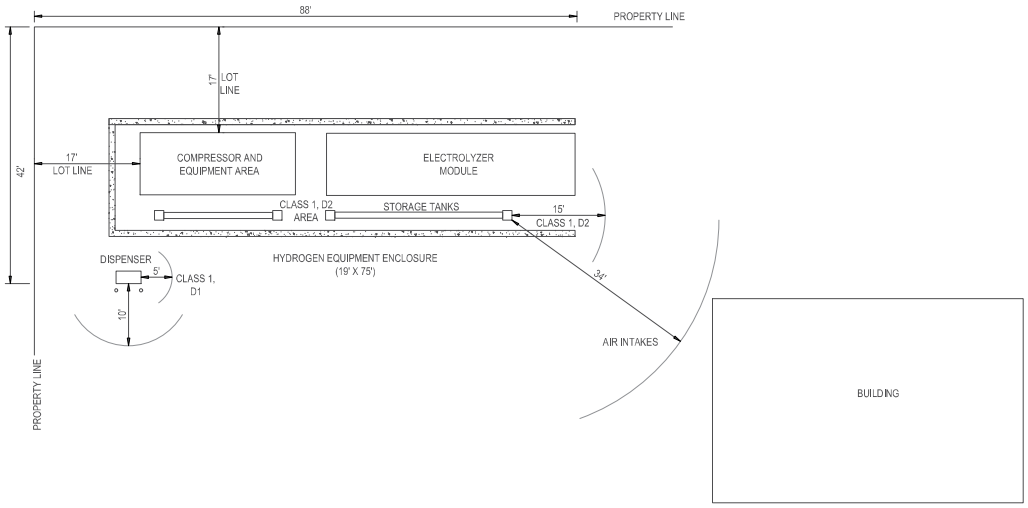
PHASE 1
DRWN: GC CHK:

SHEET 1

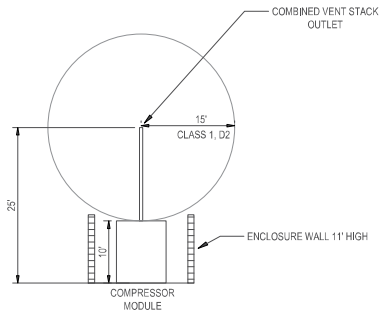
Attachment A

Figure 13: Design Option 2 - On-Site Hydrogen Generation Using Electrolysis

DRAWING 3: ON-SITE ELECTROLYSIS STATION WITH LINEAR CONFIGURATION
OVERALL SPACE REQUIREMENT OF 42' X 88' INCLUDING THE DISPENSER



DRAWING 4: SIDE VIEW OF VENT STACK EXTENDING
UPWARD FROM COMPRESSOR MODULE



THIS EXAMPLE SHOWS THAT WITH AN ENCLOSURE WALL HEIGHT OF 11' AND A VENT STACK OUTLET HEIGHT OF 25', THE CLASS 1, DIV 2 ELECTRICAL CLASSIFICATION ZONE DOES NOT EXTEND TO GROUND LEVEL.

ENCROACHMENT OF OVERHEAD UTILITIES SHOULD BE INVESTIGATED (14' PER NFPA 2)

DESIGN NOTES

IN THESE TWO LAYOUTS THE LOT LINE SETBACKS ARE IMPLEMENTED TO PROVIDE A CONSERVATIVE APPROACH FOR ESTIMATING THE TOTAL OPEN SPACE REQUIRED TO INSTALL THIS TYPE OF STATION. MODIFICATIONS TO ANY SETBACKS ARE AT THE DISCRETION OF THE AUTHORITY HAVING JURISDICTION (AHJ) AND IF IMPLEMENTED, MAY MAKE A SPACE-CONTRAINED SITE VIABLE FOR HYDROGEN INTEGRATION.

A SITE EVALUATION WILL BE REQUIRED TO DETERMINE HOW THE 34' AIR INTAKE DISTANCE AFFECTS THE REQUIRED SPACE.

- THIS ANALYSIS IS A HIGH-LEVEL LOOK AT CODE REQUIREMENTS, A MORE DETAILED INVESTIGATION BY A CODE EXPERT IS RECOMMENDED FOR SITE DESIGN
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- ENCLOSURES ARE CONSTRUCTED OF NON-COMBUSTIBLE MATERIALS AND ARE DESIGNED TO PROVIDE ADEQUATE VENTILATION
- DISPENSER CAN BE SITED ADJACENT TO EITHER SIDE OF THE HYDROGEN EQUIPMENT ENCLOSURE OR REMOTELY AT A NEW DISPENSING LOCATION OR EXISTING GASOLINE DISPENSING ISLAND

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- LOT LINES 17'
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- PARKED CARS 8'
- BUILDINGS OF NONCOMBUSTIBLE OR COMBUSTIBLE MATERIALS 14'
- DISPENSER TO LOT LINE, IGNITION SOURCE, ETC. 10'
- APPROVAL AND MODIFICATIONS TO SETBACKS AT THE DISCRETION OF THE AUTHORITY HAVING JURISDICTION (AHJ)

ELECTRICAL AREA CLASSIFICATIONS - GH2 VEHICLE FUELING STATIONS (NFPA 2, 2016)

- ALL DISTANCES MEASURED SPHERICALLY FROM SOURCE POINT
- WITH STRATEGIC PLACEMENT AND HEIGHT OF THE RELIEF VALVE AND VENT STACK OUTLETS, THE ELECTRICAL CLASSIFICATION AREAS FROM THESE SOURCES SHOULD NOT EXTEND TO GROUND LEVEL OUTSIDE THE EQUIPMENT ENCLOSURE
- CLASS I, DIV. 1 WITHIN 5' OF DISPENSER ENCLOSURE
- CLASS I, DIV. 2 UP TO 15' FROM STORAGE EQUIPMENT, BUT SHALL NOT EXTEND PAST AN UNPIERCED WALL OR GASTIGHT PARTITION. ENCLOSURE DESIGN AND LOUVRE LOCATION(S) WILL DICTATE THE DIRECTION THIS ZONE EXTENDS.

SCHATZ ENERGY RESEARCH CENTER

HUMBOLDT STATE UNIVERSITY
Sponsored Programs Foundation

MODULAR HYDROGEN STATION - ELECTROLYSIS GENERATION - 130 KG/DAY
MODULES IN A LINEAR CONFIGURATION

REFERENCE STATION DESIGN LAYOUTS FOR SPACE EVALUATION
FCEV HYDROGEN READINESS PROJECT

PHASE 1
DRWN: GC CHK:

SHEET 2

Attachment B

APPENDIX C:
Public Request for Information Responses

The released RFI and associated full responses from CalTrans and Redding Electric Utility are attached below. Responses from three members of the public are reproduced, but without reference to their names.

Response from CalTrans

"We have a mandate (EO, DGS MM, and now codified in law by legislation) for the state light duty fleet (under 8,500 GVWR) to include increasing numbers of ZEVs in our fleet when purchasing new vehicles. Currently the requirement is 15%, in 2024 it will be 50%.

DGS MM 16-07 (Increased mandate) Dec 2016 Provides many details
https://www.documents.dgs.ca.gov/osp/sam/mmemos/MM16_07.pdf

Mandate ZEV purchasing is as follows:

Fiscal Year	*EO B-16-12 (original)*	*EO B-16-12 ZEV (increased)*
2014/2015	*10%*	*10%*
2015/2016	*10%*	*10%*
2016/2017	*10%*	*10%*
2017/2018	*10%*	*15%*
2018/2019	*10%*	*20%*
2019/2020	*25%*	*25%*
2020/2021	*25%*	*30%*
2021/2022	*25%*	*35%*
2022/2023	*25%*	*40%*
2023/2024	*25%*	*45%*
2024/2025	*25%*	*50%*

We currently have 80 BEVs, 135 PHEVs and 37 FCVs.

We believe FCVs have some advantages (long range, short fueling times) over EVs although there is room for all light duty ZEVs in our tool box. The California Energy Commission (CEC) has no current plans to fund hydrogen infrastructure in the north state, that could change in the next round of funding. CEC has offered to have Caltrans be part of a joint solicitation for the next RFP, although Caltrans would have to fund them, or we could offer a site for the fueling station if the stations are only for our use. D-8 may take them up on the offer (provide funds for stations on our site) and we may include the Shop 7 site (provide no funds but provide site for station with public access). If interested, please give me a call.

And there is a heavy duty ZEV mandate coming. Governor Brown signed Assembly Bill (AB) 739, authored by Assembly Member Ed Chau (D-Monterey Park), which requires at least 15% of vehicles, with a gross vehicle weight of over 19,000 pounds that are newly purchased by state agencies, to be Zero-Emission Vehicles (ZEV) beginning in 2025, and at least 30% of those vehicles to be ZEV beginning in 2030. We believe hydrogen in the heavy duty realm **may** be the only solution for incident response vehicles because of the short time to fuel. Also, DOE has issued a PO for a hydrogen/electric hybrid sweeper.

So, with all that in mind, the following is my recommendation for your response for the questions from MCOG *(in italics)*

1. Local government staff and elected representatives: description of interest in hydrogen fuel cell electric vehicles, *(high level of interest, we are under a mandate to include ZEVs and are interested in FCVs)* specific plans and codes that have been adopted in relevant jurisdiction related to hydrogen fueling stations (n/A), interest in planning for zero emissions vehicles, and/or needs for addressing State hydrogen goals *(high level of interest).*
2. Fleet managers: description of interest in hydrogen fuel cell electric vehicles *(high level of interest),* interest in further discussing ways to incorporate fuel cell electric vehicles into local fleet *(yes, sedans, small SUVs and pickups when and if available),* ongoing efforts to incorporate fuel cell electric vehicles into local fleet, and/or needs for addressing State hydrogen goals *(very interested in getting hydrogen fueling station conveniently located for the Caltrans fleet).*
3. Emergency first responders: description of interest in emergency first responder training specific to fuel cell electric vehicle and fueling station safety, training/information that has been adopted in the local jurisdiction already, and/or needs for addressing State hydrogen goals. *(N/A)*
4. Businesses, organizations, or individuals interested in investing in hydrogen production, investing in hydrogen fueling station development, and/or developing the local market for hydrogen fuel cell electric vehicles
5. Vehicle dealerships interested in understanding hydrogen fuel cell electric vehicles *(We can provide contacts with the CEC and hydrogen stations industry and station developers.)*

In addition, they would like to know:

- Information, if available, on relevant past projects, potential project timelines, funding amounts, and location. *(The CEC can provide this info, they are a great source of expertise when it comes to the details of building stations, like: timelines, cost, sizing of the stations, whether on-site production makes sense or if the hydrogen should be trucked in. We have the names of those contacts at CEC.)*
- Any other factors, advantages, or limitations that might be relevant to the viability of regional development of a fuel cell electric vehicle market and associated infrastructure. *(Suggest engaging with the CEC.)"*

Response from Redding Electric Utility

“This appears to be an RFI for development of hydrogen fuel cell vehicles. This would be in addition to any existing electric vehicle development currently underway. After reviewing this again, it doesn’t seem to be a good fit for REU to be in the hydrogen fuel cell vehicle space. This would be more along the lines of transportation or possibly fleet management as we don’t have the expertise needed to develop a hydrogen fuel cell program.”

Responses from Members of the Public

1. “Well, my BEV has a range of over 310 miles at 65 mph, and I don’t have to go looking to find a place to refuel as the electricity comes to my garage wall. I plug in and recharge during part of the 23 hours a day I’m not driving and unplug and go when I want. 5 minutes of “refueling” is not worth it. It takes me only a few seconds to plug or unplug as I head to the driver’s door. On trips my car recharges in the time it takes to hit the bathroom.
   It’s fairly obvious that fuel cells are a lot more complicated, needing a high pressure tank PLUS the battery to drive the electric motor that I have already. This complication means that fuel cells will never have the acceptance that battery electrics already have. I’d have to drive thirty miles to refuel. This is why they are called FOOL CELLS.
   By the way, my solar panels and batteries supply all my electric needs, including my cars, plural. PG&E pays me. Tell me how fuel cells refill overnight for free and fill the high pressure tank in a fuel cell car.
   Can’t be did. Who’s paying you to push fuel cell cars??? I have access to chargers everywhere, even Ukiah. Can’t believe you’re beating this dead horse.”
2. “I don’t understand why Mendocino County is even discussing Fuel Cell infrastructure! The electric vehicle is fast becoming the norm in almost every country in the world. I think it’s a waste of time and resources to branch out into the Fuel Cell, especially when Mendocino County hasn’t even moved on the electric ones in over two years of talk and no action.
   Did they even get Costco to agree to installing a charger at the new store in Ukiah?
   By the way, when and where is Mendocino County going to install the chargers that have been promised for several years now. And what about Tesla’s commitment to install a J1772 charger in Ukiah, for the rest of us I see their 8 fancy chargers sitting with no vehicles using them, but very rarely. After 2 years there still the same users hogging the one free charger by the old Post Office. We moved up to Chevy Bolt and we’re so happy with the 220 plus miles of range, we almost never charge anywhere but at home. Mostly because I see the same two vehicles using the Ukiah charger as a parking place.
   You can see I’m quite peeved about all the talk and no action.”

3. I have a nephew in our expanded family who has a PhD in hydrogen fuel cells and was at one point the lead guy on hydrogen fuel cells at the Department of Energy. He now works on fuel cell cars for BMW. says he would be happy to speak with you. He is very knowledgeable. Here is his contact information.

APPENDIX D: Memo Regarding HSU Station Feasibility

The full memo is included in the following pages.

Schatz Energy Research Center
SERC

Memorandum

November 15, 2017

To: Matthew Marshall, Executive Director, RCEA
From: Greg Chapman, Senior Research Engineer, SERC
Subject: Assessment of the HSU Hydrogen Fueling Station for Future Fueling Operations

Background

The HSU Hydrogen Fueling Station was designed and built in 2008 to fuel in accordance with the existing codes and standards. The station produced ~ 2 kg of hydrogen a day and stored the gas at 6000 psig (420 bar) in two stationary tanks. The station's commercial dispenser delivered hydrogen at 5000 psig (350 bar) to the vehicle and for the first few years of operation the vehicle's hydrogen system (specifically tank pressure and temperature) was monitored during fueling operations via a communications cable between the vehicle and the dispenser. The station's dispensing system did not include a gas chiller and therefore, the fueling rate was limited by a throttle valve to prevent the on-board hydrogen tank from exceeding its maximum allowable temperature.

FCEVs released in the following years were designed with on-board storage pressures of 10,000 psig (700 bar), the current industry standard. In 2012, the station was upgraded to provide 700 bar fueling capability by adding a new high-pressure compressor and dispensing system. After the existing commercial dispenser filled the vehicle's tank to 350 bar, the new compressor was operated to slow-fill the vehicle from 350 bar to 700 bar. There is no gas chiller in the upgraded system and the filling event required two operators to be present to monitor the system during the hour-long fill. The system was designed as an R&D/demonstration station to allow for long distance travel of the FCEV's, not as a commercial station.

Existing Station Condition and Issues with Upgrading to a new "Standard" Fueling Station

The majority of the hydrogen system is 10 years old, in poor condition, and has been inoperable for over two years. In addition to the system's low generation rate and gas storage capacity, the system design (manual operation) is not appropriate for public fueling. **Future fueling operations will require replacement of the entire system.**

The initial site layout and also the 2012 upgrade expansion design layouts presented some challenges in order to conform to the NFPA codes and standards. The site is constrained by a student parking lot to the north, University bus parking on the south, and vegetation to the west. Installation of a new, larger system similar to other stations being built in California would require a detailed engineering review to see if and how the new equipment may fit into the space and still meet applicable codes. Expansion to the east may be possible, but would

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require a significant internal HSU process for approval. If additional parking spaces were lost, approval would be unlikely.

Some of these current "standard" hydrogen fueling station designs store gas at pressures up to 15,000 psig. This is two and half times the current station's storage pressure (6000 psig) and may impact the code clearance requirements. Even if the station could be designed to accommodate this level of pressure storage in the existing footprint, there needs be an open discussion with the stakeholders (University and the station owner/operator) to assess the level of comfort with this situation given the campus environment and foot and vehicle traffic nearby.

The source of fuel for these stations can be either on-site generation or delivered tube trailers. Each of these presents challenges at this site. Operation of a newly purchased electrolyzer will increase the on-site electrical load and in conjunction with a new gas chiller and higher capacity compressor, will require a new electrical service to be trenched and routed to the site from the main Plant Operations building. A delivered hydrogen tube-trailer has unknown costs and will require sufficient code clearances from parked vehicles, electrical systems, vegetation, and walkways. This will be difficult in the limited space.

The amount and pressure of gas storage is the biggest issue with regards to safety. Modifications to the station will obviously require the full support from the University and any changes to the station will require full design approval by the AHJ (the State Fire Marshall). These approvals will be problematic, at best.

Major Infrastructure and Equipment Required for a new "Standard" Fueling Station

The major civil work and hydrogen equipment required for a publically accessible fueling station include:

- New block walls in order to meet code requirements (i.e. 2-hr fire walls). Demolition of existing block walls may be required.
- Significant trenching across the Plant Operations parking lot for a new electrical service.
- Trenching between the hydrogen system to the new commercial dispenser.
- New higher capacity electrolyzer (if on-site generation is chosen)
- New high pressure, high flow compressor
- New on-site stationary storage tanks
- New gas chiller
- New commercial dispenser
- New hydrogen plumbing and balance of plant components
- New safety devices (IR flame detectors, gas sensors)

Cost Estimate

Essentially, a new hydrogen station is required. According to the latest AB8 Joint report, **installation costs are approximately $2.1 million for a 100 kg/day station with delivered hydrogen**. This is certainly a larger capacity system than what is needed. A lower capacity system with on-site generation may be feasible and less expensive, but the cost versus limited benefits (limited amount of fuel / vehicles served) would need to be further examined.

Recommendations

As mentioned, the poor condition and manual fueling design of the existing fueling station makes it not appropriate for public fueling. The station will need to be replaced in order to provide future fueling. If the University is supportive of this undertaking and can provide additional land to the east of the station, installation of an industry-standard station may be feasible. Although it may be technical possible, **siting a station of this type (large amounts of high pressure gas) in a campus parking lot that is extremely crowded with cars and students is less than ideal and does not seem like an appropriate location for a station of this kind. It is unlikely that the university would approve a new station. Another site, almost certainly off the HSU campus, is a better option.**

A different option that may be more appropriate for an off-campus site is a **SimpleFuel ™** refueler. This device is an on-site hydrogen generation and dispensing system that currently won the 2016 $1 million H2 Refuel H-Prize Competition. The refueler is a self-contained system that generates, compresses, stores and dispenses gas up to 700 bar while meeting the industry fueling standards (SAE J2601 and SAE J2719). The marketing brochure (attached) states that it generates up to 10 kg/day, however the dispensing flow rate / time to fill is not known and may not be sufficient for small fleet fueling operations. The capability of accepting credit card payment is also unknown. Further investigation would be needed to verify the product claims and when the device will be available for purchase.

APPENDIX E: CalTrans-SERC White Paper

Hydrogen Fueling Infrastructure for CalTrans Districts 1 & 2

CalTrans Division of Equipment & Schatz Energy Research Center

December 2016

Background

As a state agency in California, CalTrans is required by Management Memo 16-07 to include zero emission vehicles (ZEVs) as part of their new vehicle purchases. The requirement in the current year is that 10% of new vehicles must be ZEVs; this requirement ramps up to 50% by 2024-25.

Responding to this mandate, CalTrans has recently purchased 20 Toyota Mirai fuel cell electric vehicles (FCEVs). FCEVs, with their long range and short fueling times, are often a better fit for agency needs than battery electric vehicles, which generally have significantly shorter ranges and take hours to recharge.

CalTrans is looking to place at least one Mirai at District 1 headquarters in Eureka. In order to do so, a reliable hydrogen fueling station must be in place. The only hydrogen station in District 1 territory is the Humboldt State University Hydrogen Station built and operated by HSU's Schatz Energy Research Center (SERC). Though the HSU station has in the past been approved by Toyota to fuel their vehicles, it is not SAE J2601 compliant and upon inquiry, Toyota did not want the Mirai to fuel at a station that does not have this certification.

CalTrans District 2, headquartered in Redding, is another possibility for placement of a Mirai. There are currently no hydrogen fueling stations located in District 2 territory. At both the Eureka and Redding locations, the mandate of 16-07 will mean that additional FCEVs will join the fleet in coming years.

Infrastructure Plan

There is clearly a need for modern, J2601 compliant hydrogen stations in Eureka and Redding. An additional station in Ukiah would conveniently link the North Coast region with the Bay Area. These stations would serve the need of fleet operators like CalTrans, as well as serve the general public as retail stations. A fleet operator such as CalTrans will guarantee the stations are utilized during the initial period when private sector demand will be low.

Building out a few key stations in the rural North State region is the key to intrastate mobility as Eureka and Ukiah (US 101) and Redding (Interstate 5) are located on the two main north-south highways. Having retail stations available will enable adoption of

FCEVs by the general public and aid the state in reaching its aggressive goals for getting these vehicles on the road.

CalTrans proposes to team with the SERC to design and build three new J2601 compliant hydrogen stations in northern California. The first station would be sited in Eureka, with stations in Redding and Ukiah to follow. SERC has over 25 years experience with hydrogen technology, built the HSU Hydrogen Station in 2008, and has operated and maintained it since.

CalTrans and SERC will also solicit FCEV manufacturers to collaborate with us. Toyota, Honda, Hyundai, and Daimler are all possible partners. Toyota has already indicated a willingness to work with us.

SERC is also involved as technical lead in the Fuel Cell Electric Vehicle Planning Project, a California Energy Commission funded effort to site hydrogen infrastructure in the North State region. As part of this work, SERC is already funded to conduct initial engagements with relevant agencies holding jurisdiction, solidify a relationship with site owners willing to host a fueling station, and complete a design and cost estimate for two hydrogen stations at the 10% engineering design level. These designs will serve to jump start the proposed project. In addition, this Planning Project involves partner agencies in Glenn, Mendocino, Del Norte, Trinity, Siskiyou, Shasta, Tehama, and Humboldt Counties, all of whom are natural partners in building out stations in the North State.

It will take at least two years to complete the first of these stations, so reliable fueling for the interim period will be necessary. For Eureka, the existing HSU station can serve as an interim solution. For Redding and Ukiah, a small portable fueling system manufactured by SimpleFuel™ could serve the same purpose.

Research Opportunities

The stations we are proposing are called “anchor stations,” as the fleet operator provides the consistent fuel usage necessary to make the economics viable while FCEVs are adopted more generally. As such, this project provides the opportunity to study the impact of these anchor stations in building demand for FCEVs. This is especially true in rural areas of the state where lower population density makes station economics more problematic.

A study would measure direct impact parameters such as fuel dispensed, vehicle miles traveled, greenhouse gas emissions reduced, etc. Equally important, it would query drivers of FCEVs, including CalTrans personnel, to understand their likes and dislikes concerning their driving and fueling experience. These lessons learned would inform further efforts to extend hydrogen fueling infrastructure and encourage adoption of FCEVs in the rural areas of the state.