

Exhibit to Agenda Item #1

Brief the Board on the status of SMUD's Zero Carbon Hydrogen outlook and activities.

Board Strategic Development Committee and Special SMUD Board of Directors Meeting

Tuesday, September 12, 2023, scheduled to begin at 6:00 p.m.

SMUD's Hydrogen Overview Briefing

September 12, 2023

Powering forward.
Together.

Board Strategic Development Committee and Special SMUD Board of Directors Meeting



Agenda

- DOE Funding – Possible Funding Timeline
- ARCHES – SMUD's Projects
- Hydrogen Demand for Blending at SMUD Concept sites
- Questions



Possible Funding Timelines

Proven Clean Tech

	2022	2023	2024	2025	2026	2027	2028	2029	2030
DOC Program Timeline		Phase 1 (Development)							
			Phase 2 (Implementation and Construction)						
		Pre Construction							
			Construction						
						Operations			
H2 Hub FOA		Award Notifications Fall 2023							
			Phase I: Detailed Project Planning (<= \$20M + 50% cost share) Duration: 12-18 Months						
				Phase II: Project Development, Permitting, and Financing (up to 15% of total DOE funding with 50% cost share) Duration: 2-3 years					
						Phase III: Installation, Integration, and Construction (no defined \$ range) Duration: 2-4 years			
								Phase IV: Ramp-up and Sustained Operations	
								(no defined \$ range) Duration: 2-4 years	



ARCHES: SMUD Submitted Concept Papers

Concept 1:

Electrolytic Hydrogen Production for Power, Transportation, and Industrial Applications

Overview:

SMUD is partnering with Air Products and Chemicals, Inc. (APCI), Sacramento Metropolitan Air Quality Management District (SMAQMD), and others to demonstrate and deploy hydrogen production and utilization for power, transportation, and industrial applications in the greater Sacramento Region. applications.

Power Consumption of 363 MW

Green Hydrogen production of 100 TPD



ARCHES: SMUD Submitted Concept Papers

Concept 2:

Thermochemical Conversion of Biomass to Hydrogen for Power, Transportation, and Industrial Applications

Overview:

SMUD is partnering with Mote, Inc. in developing a first-of-a-kind (FOAK) biomass gasification facility in California to produce carbon-negative hydrogen. Mote's technology will generate hydrogen by gasifying wood waste-based biomass with integrated carbon capture and geological sequestration. The project will process approximately 1,150 metric tons per day (MTPD) of biomass to produce 60 tons per day or greater than 21,000 tons of hydrogen annually and geologically sequester 1,130 MTPD or more than 400,000 tons of carbon dioxide annually. Due to the facility's carbon sequestration component and minimal emissions, the team expects the hydrogen to have a carbon intensity score of $-150\text{gCO}_2/\text{MJ}$.

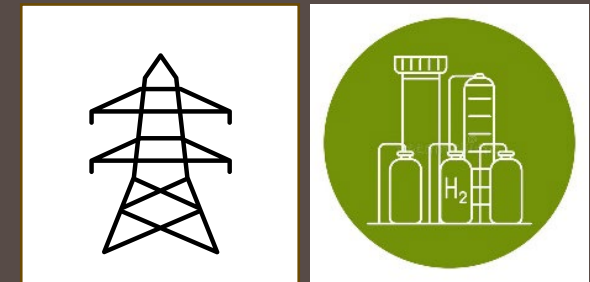
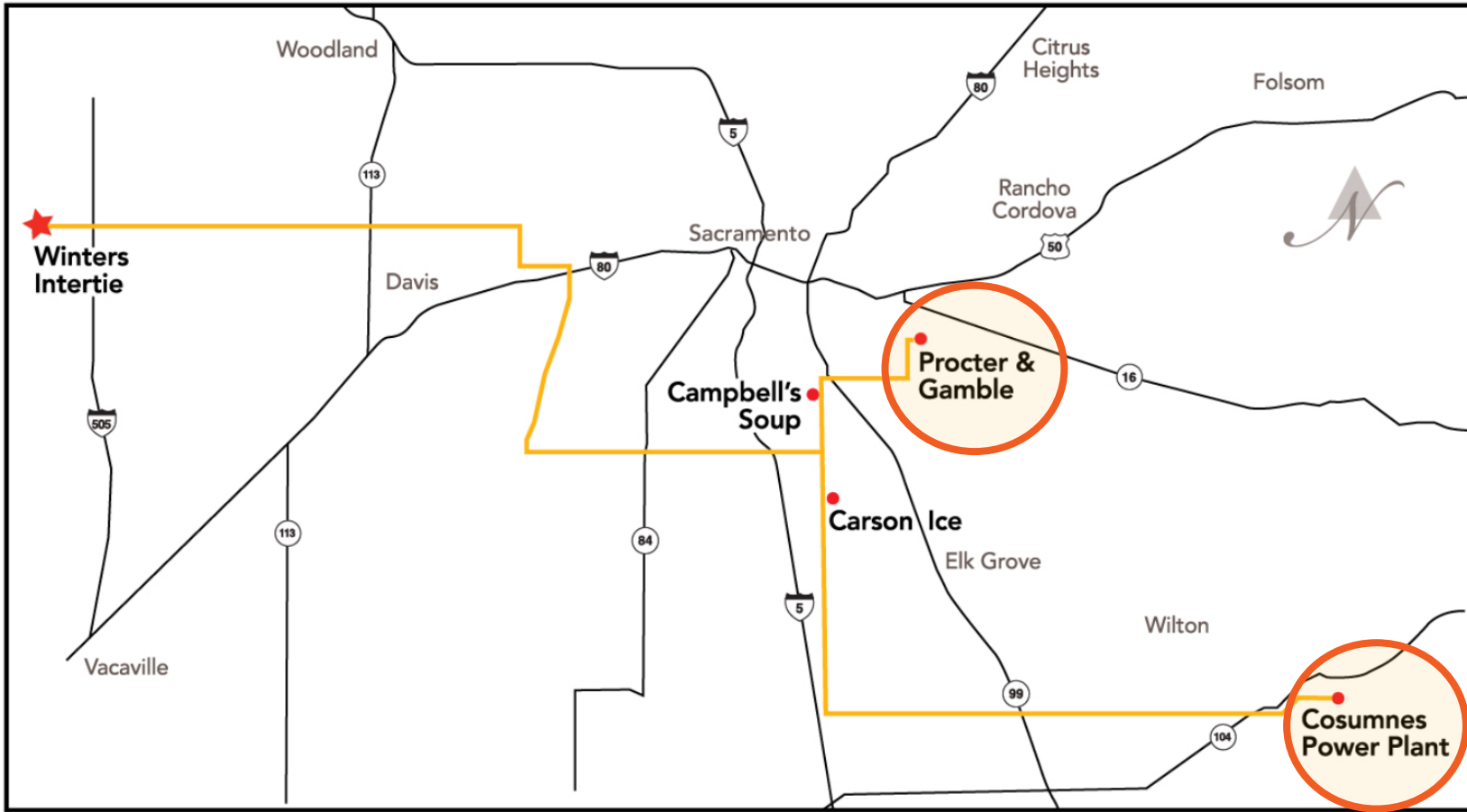
Collaboration: Mote, SacAQMD, El Dorado Forest Working Group

Costs: Estimate costs is \$500 million

Green Hydrogen production of 60 TPD



Visual





Hydrogen Demand for Blending: Power/Electricity Production- Rough Estimates

Table 2-4 Electrolyzer Sizing and Performance Summary

Parameter	Campbell	McClellan	Carson CTG1	Carson CTG2	P&G CTG1AB	P&G CTG 1C	Cosumnes
Hydrogen Blend Limit	27%	98%	35%	35%	35%	35%	15%
PEM Arrays and Modules	3 Array, 72 Modules	18 Array, 432 Modules	2 Array, 48 Modules	2 Array, 48 Modules	3 Array, 72 Modules	2 Array, 48 Modules	5 Array, 120 Modules
Hydrogen Production	1,925 lb/hr	12,584 lb/hr	975 lb/hr	977 lb/hr	2,013 lb/hr	1,008 lb/hr	3,348 lb/hr
DC Power Consumption	45.3 MW	296.4 MW	23.0 MW	23.0 MW	47.4 MW	23.7 MW	78.9 MW
AC Power Consumption	45.9 MW	299.9 MW	23.2 MW	23.3 MW	48.0 MW	24.0 MW	79.8 MW
Stack Efficiency (Nominal)	76.4% (17.88 kWh/lb H ₂)						
Stack efficiency (Minimal)	88.8% (17.88 kWh/lb H ₂)						
Hydrogen Pressure	15.95 psia						
Hydrogen Temperature	104°F						
Hydrogen Purity	>99.8% (ref. to dry gas)						
Hydrogen Contaminants	Oxygen only						
Load Ramping	≥ 10%/s of nominal electrical load (start/shutdown: 3.3%/s)						
Load Range	0 – 100%						
Estimated Plant Footprint	4,300 ft ²	25,800 ft ²	2,900 ft ²	2,900 ft ²	4,300 ft ²	2,900 ft ²	7,200 ft ²
Hydrogen Storage Mass	46,200 lb	302,016 lb	46,834 lb		72,404 lb		80,362 lb
Hydrogen Storage Volume	103,095 ft ³	673,947 ft ³	104,509 ft ³		161,771 ft ³		179,327 ft ³
Storage Vessels	7	44	7		11		12

Potential Concept:
Power burn ~15K tons
H₂/year @ current blending
limits

Potential Concept:
Power burn ~200K tons
H₂/year @ 100% blending