



ARCHES Project Submission Q&A

The **ARCHES** Team December 6, 2022







ARCH₂ES

ARCHES Concept Paper Summary

- **ARCHES** H2 LLC: public-private partnership to facilitate & oversee design, development, & deployment of hydrogen in CA
 - ✤ Broadly representative governance
 - ✤ Projects performed by public & private partners, overseen by ARCHES
 - Section ARCHES manages funding, state/local interfaces, and cross-cutting topics
- Funding: \$1.25B DOE + \$4.75B from state/local gov't & private partners

Interconnected Sectors:

- 1. Power plants
- 2. Heavy-duty Transportation
- 3. Port operations

• ARCHES Goals:

- ♥ Clean, renewable H2
- $\$ 500 tons/day by 2030 \rightarrow 45,000 tons/day by 2045
- ♥ Substantial reductions in GHG and pollutant emissions
- Extensive benefits to California communities and workers
- Example network of projects demonstrating ARCHES potential in CA
- Cross-cutting activities & workgroups broadly supporting interconnected projects and market development

Vetting Criteria for projects*

Enables Sustainable H2 Economy and the ARCHES Ecosystem

Realizes Co-Funding and Market Viability

Provides Realizable and Ready Actualization

Provides Strong Community Benefits

*not for crosscut activities

Large-scale sustaining infrastructure deployment in one or more H2 sector(s) the enables optimal hydrogen ecosystem functionality to accelerate hydrogen capacities over time to meet cost targets

Provides critical project cost support and strong financial and business plan to realize sustainable marketplace

Is ready to initiate with in-depth timeline, site selection and control, committed leadership, quality team, and community support by leveraging demonstrable experience in similar scale projects.

Enables deep decarbonization and depollution based on life-cycle emissions while meaningfully engaging and benefiting the local communities including commitment towards organized labor

Enables Sustainable H2 Economy and the ARCHES Ecosystem

Large-scale sustaining infrastructure deployment in one or more H2 sector(s) the enables optimal hydrogen ecosystem functionality to accelerate hydrogen capacities over time to meet cost targets



- Metrics
 - ♦ Overall clean hydrogen capacity numbers over time
 - 🖏 Enables deep decarbonization based on life-cycle emissions relative to existing technologies as measured by kg CO2 avoided and/or removed
 - b Proximity to existing distribution and storage infrastructure as well as other sector projects (e.g., consumers, producers)
- Criteria and evaluation
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 - Focused on hard to decarbonize and directly electrify sectors
 - Market analysis and system value benefits including reduced cost compared to incumbent technologies and expanded end use markets for clean hydrogen
 - Scalable site location and project that provides future growth and expansion opportunities
 - 🖏 Feasibility
 - Robust and resilient design with safety issues considered
 - Minimizes environmental risks including adverse impacts to air, soil, water (e.g. drought impacted, potable or other critical water use needs) or increase in life cycle GHG footprint
 - Proximity of necessary resources
 - begree of how it accelerates transformational commercial deployments in areas that industry is not likely to undertake because of technical and financial uncertainty
 - Provides route towards meeting relevant cost targets
 - ♦ Agrees with ARCHES, state, and local principles, needs, and climate goals
 - Adds to end use and feedstock and geographic and socioeconomic diversity
 - Enables other sectors and parts of the ecosystem
 - Leverage existing proposed ARCHES projects and provides transferable lessons learned but is not duplicative
 - Matches well with critical sector needs and various hydrogen capacities and capacity factors over time including necessary redundancy
 - Provides system operational resiliency
 - Aligns with California state policy objectives (e.g., Scoping Plan, Integrated Energy Policy Report, Integrated Resource Plan, etc.)
 - 🖖 Other uniqueness such as high visibility and ancillary benefits (e.g., increasing public awareness, helps workforce development, build out of renewable, etc.)

Realizes Co-Funding and Market Viability

Provides critical project cost support and strong financial and business plan to realize sustainable marketplace



- Metrics
 - Amount, type, and source of cost share provided in dollars and as percentage of total project cost
 - 🗞 Amount, type, and source of requested and/or secured co-funding (Federal, State, Local)
- Criteria and evaluation
 - 🖖 Economic viability, bankability sustainability, and potential growth beyond DOE funding including after project period
 - Incremental costs for hydrogen technologies over planned for incumbent transitions
 - Private funding possibilities (i.e., venture and equity possibilities)
 - Dependence on ARCHES funding
 - Type of cost share and its origin and security
 - Comprehensive business plan including market development over time
 - Increases H2 ecosystem system financial strength and resiliency including manufacturing in the USA
 - Utilization of existing tariff structures, federal and state tax incentives, etc.
 - ♦ Alignment with state funding priorities
 - 🏷 Manufacturing and procurement in USA (buy America) and ARCHES region including construction materials, supply chain, etc.

Provides Realizable and Ready Actualization

Is ready to initiate with in-depth timeline, site selection and control, committed leadership, quality team, and community support by leveraging demonstrable experience in similar scale projects



- Metrics
 - ♦ % work already accomplished
 - ♥ TRL levels of various technologies
- Criteria and evaluation
 - b Comprehensive and realistic project timeline with key decisions points and metrics
 - Established teams with letters of intent/MOUs/agreements with key equipment suppliers
 - ♥ Site control including space availability, control of easements, and site selection
 - Regulatory approval including readiness for or existing permitting
 - Have experience and demonstrated record of leadership in similar scale projects (federally funded preferred) including possibly hydrogen and proven ability to deliver in time including examples of project completion
 - Strong history of safety, outreach, and community engagement
 - Strong commitment to hydrogen and CA region
 - Understanding of regulatory and policy environment especially in CA including CEQA
 - ✤ Project commitment
 - Committed infrastructure company leadership
 - High commitment from public and private stakeholders including local communities
 - ♦ Ability to and readiness to enact project
 - Leverage and reuse existing infrastructure versus relying on other upgrades or new infrastructure development
 - Changes to already planned modifications and upgrades
 - Readiness to procure in the near-term
 - Supply chain cognizant and/or can overcome

Provides Strong Community Benefits

Enables deep decarbonization and depollution based on life-cycle emissions while meaningfully engaging and benefiting the local communities including commitment towards organized labor



- Metrics
 - Clean Communities: Reduction in diesel and other fossil fuel consumption as measured by gallons avoided
 - b Clean communities: Reduction in criteria pollutants as measured by kg avoided and/or removed
 - Workforce development: # of careers created and/or retained locally
- Criteria and evaluation
 - ♥ Overall goals and alignment with Justice 40
 - b Provides societal benefits and mitigates/minimizes negative impacts, especially on DACs
 - Does not increase energy cost burden of impacted communities, especially for low income consumers in the value chain
 - Verifiably does not increase toxic or criteria pollutant emissions during life cycle nor creates additional resource stresses in various communities
 - Reduction of health issues and other health benefits
 - Local infrastructure improvements and community services
 - bemonstrable support of local communities (DACs, Tribal, etc.) where project is located and/or impacts including enabling benefits
 - Meaningful and sustained engagement of local stakeholders and community-based organizations including structured approach for ensuring communities have a say in how they want to benefit from this work
 - ♦ Strong workforce development and organized labor interactions
 - Supported by existing Workforce and Community Agreements (e.g., good neighbor agreements, workforce agreements, project labor agreements, collective bargaining agreements, and similar agreements)
 - Focus on inclusion, diversity, equity, accountability workplace
 - Committed to organized labor
 - Utilize minority businesses, etc. for supply chain
 - Opportunities for local jobs and jobs retained including careers and lasting benefits
 - Track record and expertise with demonstrable strong and pre-established programs for community engagement



DOE Project Phases and Timeline





Project Submittal

Please make sure to mark anything you consider confidential
Highlighting works



Project Summary (1/2 page):

• Briefly summarize the proposed scope of the project, major anticipated benefits (GHG/pollutant reductions, workforce and community, etc.) and long-term growth potential beyond the 8-year DoE funding period after which the project would become self-sustaining and grow further. How the proposed project will fulfill the 4 kg CO2 lifecycle emissions Carbon Intensity target proposed by the DOE and other environmental considerations.

𝔄 What do we plan to do?

𝔄 Why do we want to do it?

𝔅 What will be the benefits to impacted communities and labor?

𝔅 What is the growth potential beyond the first eight years (DoE funding period)?

𝔄 Why this team?

Metric		Value	Units	
H ₂ quantity			ktonnes per day	
Spring			Average tpd	
Summer			Average tpd	
Fall			Average tpd	
Winter			Average tpd	
Approximate start and end dates				
Phase 1	Start:	end:	mm/yy	
Phase 2	Start:	end:	mm/yy	
Phase 3	Start:	end:	mm/yy	
Phase 4	Start:	end:	mm/yy	
Project sectors				
CO2 avoided and/or removed			kg CO2 per (year or kg H ₂)	
Reduction in criteria pollutants			kg per (year or kg H ₂)	
Reduction in diesel and other fossil fuel consumption			gallons per (year or kg H ₂)	
Location address(es)				
H2 storage amount			kg H ₂	
% of project work (Phase 3) already completed			%	
% of project scoping (Phase 1, Phase 2) already completed			%	
Cost share amount			\$k	
Cost share type			Money, in-kind labor, in-kind equipment, etc	
Cost share source			Debt, cash on hand	
Funding requested amount			\$k	
Funding requested type			Money, in-kind labor, in-kind equipment, credits, etc	
Funding requested source			Federal, local, state	
Technology readiness level (by major component)				
# of careers created and/or retained locally			FTE by job class	
Energy consumption by fuel type (electricity, diesel, hydrogen, biomass)			Gallons, kg or kWh per (year or kg H ₂)	
Expected hydrogen leakage or boiloff			kg per (year or kg H ₂)	
Consumables used			Mass per (year or kg H ₂)	
Potential sources and types of criteria air pollutants or emissions			kg per (year or kg H ₂)	
Land footprint			Acre	
Water consumption			Gallons (per year or kg H ₂)	
Water source				

Technical Overview (5 pages)

- Overview of the technical and design of the project including the following:
 - & Sector(s) addressed and performance projections including preliminary carbon intensity of process or produced hydrogen
 - ✤ Scope (include rationale, geographic region, preliminary site(s) ...)
 - 🔖 How it will interact and enable other sectors and sustainable hydrogen ecosystem including dependences on the other sectors
 - ✤ Technologies being utilized including TRL level(s), non-commercial or commercial technologies,
 - System integration and infrastructure including existing, leveraged, or new requirements, and noting of possible changes to already planned modifications and upgrades
 - ♥ *Resource and feedstock requirements including their proximity*
 - by How it will minimize environmental risks including adverse impacts to air, soil, water (e.g. drought impacted, potable or other critical water use needs) or increase in life cycle GHG footprint including initial project LCA (if done)
 - rightarrow Environmental impacts including anticipated waste streams and reductions in GHG and criteria pollutants
 - ى ♦ Ability to and readiness to enact project including current level of completion
 - \clubsuit Process flow diagram
 - Preliminary project/execution schedule major tasks and milestones (approx. Q4 2023 Q4 2030; 8 years, four phases) including cost estimates and proposed Go-NoGo criteria
 - \clubsuit Status of engineering design
 - 🖏 Status of procurement of critical technologies and their (anticipated) source (especially if not made in the USA)
 - ♥ Safety plan including concerns and issues and prior experience
 - ✤ Any unique or ancillary benefits



Business Plan (3 pages)

- The plan should provide a top-level description, schedule, and status, of all critical path contracts and agreements relevant to the project. Be sure to include:
 - Initial Market Analysis and TEA including reduced cost compared to incumbent technologies and expanded end use markets for clean hydrogen with a route towards meeting relevant cost targets. Including any dependence on RECs, IRA credits, etc. and their integration into the project and plan and schedule to achieving long-term financial viability, beyond DOE and other federal funding
 - 🗞 Key Contracts, and Agreements including
 - Letters of intent/MOUs/agreements with key equipment suppliers or partners
 - Permitting status (NEPA/CEQA, municipalities, etc)
 - Off take agreements
 - Supply agreements
 - ♥ Primary Site(s) Selection and current state of site control
 - & Current and future commercial feasibility of the proposed technology(ies) and infrastructure including ancillary benefits
 - begree of how it accelerates transformational commercial deployments in areas that industry is not likely to undertake because of technical and financial uncertainty
 - Scrowth plan including both location(s) and technology and financial scalability, expansion opportunities with capacity numbers, modularity and incremental growth



Financial Plan (2 pages)

- The preliminary plan (include cost share) for funding for project development in Phases 1 and 2, funding for Phase 3 including medium-term financing for machinery and equipment, and longer-term financing for the site and facility including sources and uses, and any required funding beyond internal cash flow including working capital financing in Phase 4. Please include:
 - ✤ ARCHES support requested per phase
 - ♦ Amount, type, and timing of cost share and its origin and security
 - ✤ Impact that the DOE funding would have on the proposed project
 - 🗞 Existing federal, state, local, and private financial support
 - ♥ The financial strength of the lead and partner organizations
 - Stee amount of expected traditional equity investments (identify participants and level of participation, if applicable) noting the incremental costs for hydrogen technologies over planned for incumbent transitions
 - ♥ The timing of expected equity contributions and/or debt funding
 - ✤ The timing of repayment of expected debt funding
 - 🖖 If debt is contemplated, provide a plan for managing potential interest rate risk and default risk
 - If tax equity or other non-traditional equity investments are contemplated, highlight any structural requirements that might arise from such investments and Source should also be detailed including:
 - Up-front Capital Investment
 - Variable Operating Expenses for Energy and Feedstock
 - Refurbishments, Capital Replacements, and Overhauls
 - Fixed and Other Variable Operating Expenses
 - Financing Procurement and Structure
 - ♦ Other Incentive Availability



Community Benefits Plan (3 pages)

- Description as to the project benefits and anticipated and existing community engagement strategy. This plan should include:
 - ♦Alignment with Justice 40 initiative
 - ⇔Approach towards Diversity, Equity, Inclusion and Accessibility (DEIA)
 - Societal benefits including mitigating negative impacts such as energy cost burden and pollutant emissions
 - &Local infrastructure improvements and community services
 - How the project invests in the American and California workforce including workforce and community agreements and development of sustained local careers and jobs
 - Sexisting or proposed engagement strategies for local communities
 - Sany plans on development/growth/establishing business/manufacturing in CA region



Management and Organization (1 page)

- Description of project management and commitment from lead and any partner organizations and key stakeholders. Also should address:
 - ♥ Project Team qualifications
 - Existing relationships with industry and communities
 - Sexperience and demonstrated record of leadership in similar scale projects (federally funded preferred) including possibly hydrogen and proven ability to deliver in time including examples of project completion
 - Understanding of regulatory and policy environment especially in CA



Risk Analysis and Mitigation (1 page)

Key Risks	Impact	Risk Mitigation and Response Strategy



ARCHES Support

Any specific requests, needs, etc.
Connection to specific projects
Technological needs or help