California Hydrogen Hub (ARCHES) EIS

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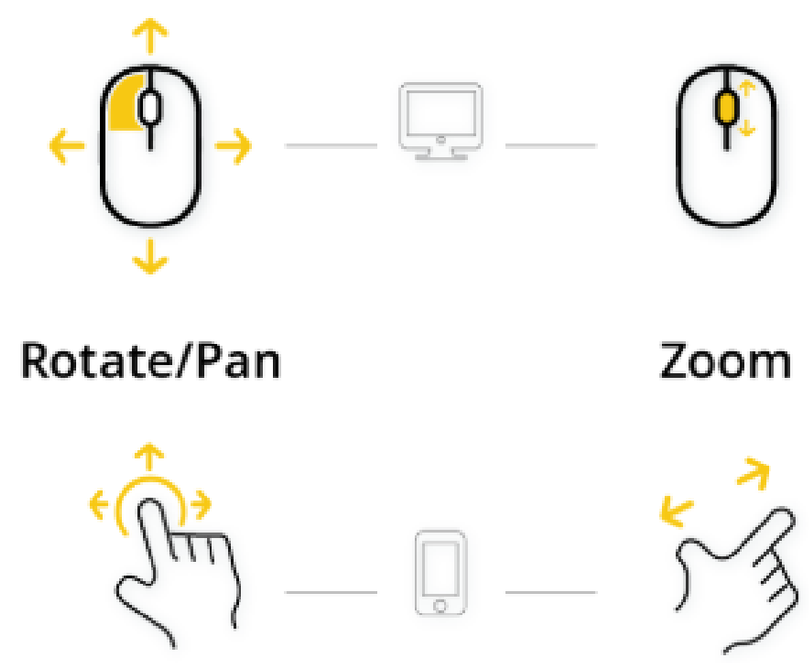

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WELCOME

Scoping Meeting
for the California Hydrogen Hub (ARCHES)
Environmental Impact Statement (EIS)

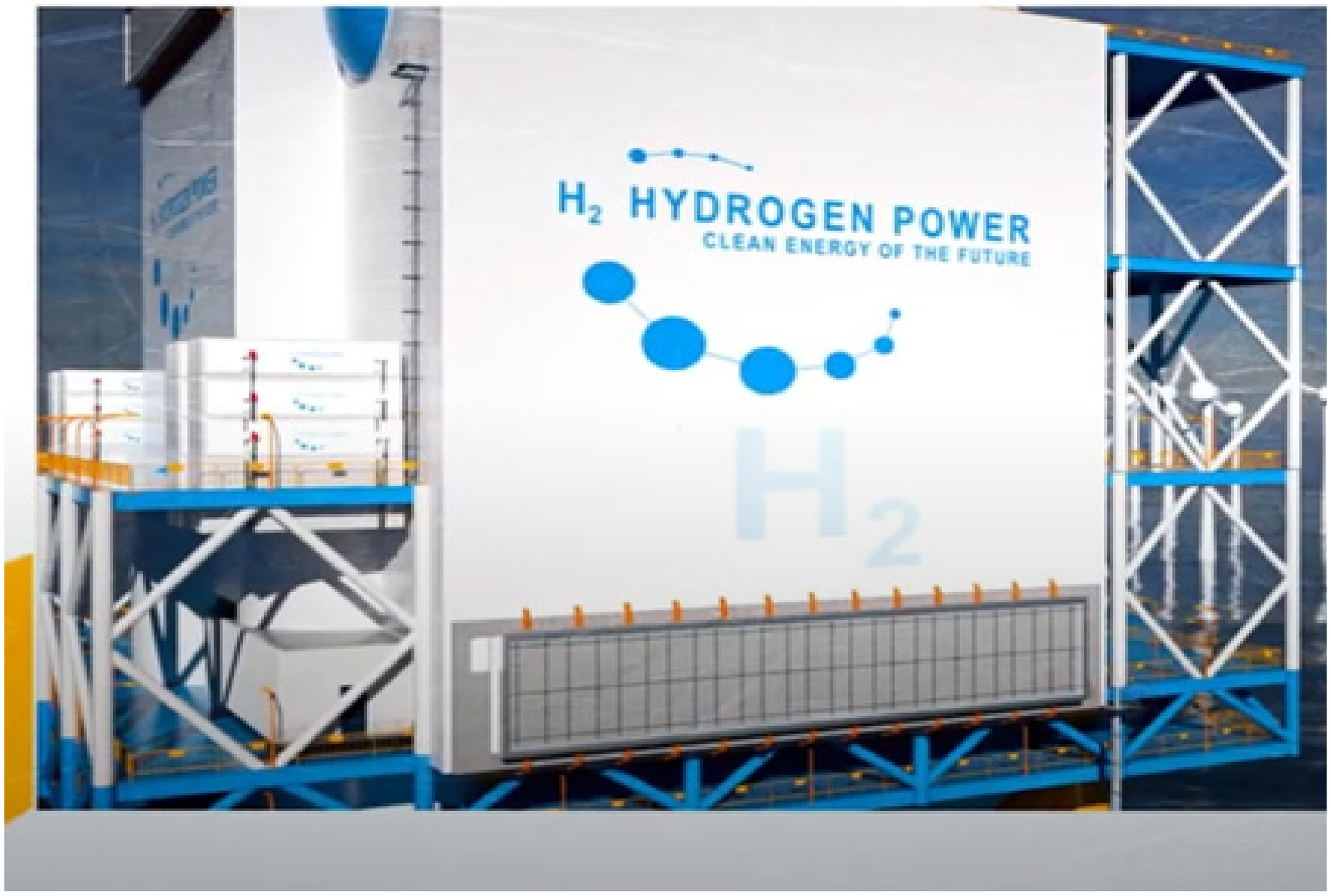
Office of Clean Energy Demonstrations (OCED)
U.S. Department of Energy (DOE)

DOE/EIS-0570
Regulations.gov Docket: DOE-HQ-2024-0087

DOE's Proposed Action

To provide financial assistance to the Alliance for Renewable Clean Hydrogen Energy Systems (known as ARCHES) to facilitate the design, construction, operation, and maintenance of the

California Hydrogen Hub



DOE's Purpose and Need

The purpose and need for DOE's action is to comply with its statutory mandate in Bipartisan Infrastructure Law (BIL) to catalyze investment in the production, processing, delivery, storage, and end-use of clean hydrogen, and contribute to the development of a national clean hydrogen network. The proposed action of funding the California Hydrogen Hub would fulfill this mandate by accelerating the deployment of clean hydrogen technologies and enabling infrastructure to attract greater investments from the private sector and promote substantial U.S. manufacturing of numerous hydrogen technologies.

DOE's purpose and need in funding the California Hydrogen Hub also includes funding a clean hydrogen hub that meets certain BIL criteria for the Regional Clean Hydrogen Hubs program. The proposed California Hydrogen Hub meets these criteria by:

- Demonstrating feedstock diversity by including the production of clean hydrogen from renewable energy sources.
- Demonstrating end-use diversity by including the use of clean hydrogen in the electric power generation and transportation sectors.
- Enabling DOE to meet the geographic diversity criterion by being located in the California region and using energy resources that are abundant in that region.
- Creating opportunities for skilled training and long-term employment for residents in the region.

Why Hydrogen?

Hydrogen has several benefits, when it comes to energy and the environment. Here are some key advantages:

- **Clean Energy**: Hydrogen can be used to produce energy with near-zero emissions. When used in fuel cells, the only byproducts are water and heat, making it a very clean energy source.

- **Sustainable**: Hydrogen can be produced using renewable energy sources such as wind and solar and generated from waste organic materials (biogenic sources). This makes it a sustainable energy solution for the future.

- **Energy Storage**: Hydrogen can store energy for long periods, which is useful for balancing supply and demand. It can be used to generate electricity when needed.

- **Versatility**: Hydrogen has versatile applications across various sectors, such as transportation, industry, and residential heating. It can power fuel cell vehicles and provide heating for properties, contributing to overall health and wellness.

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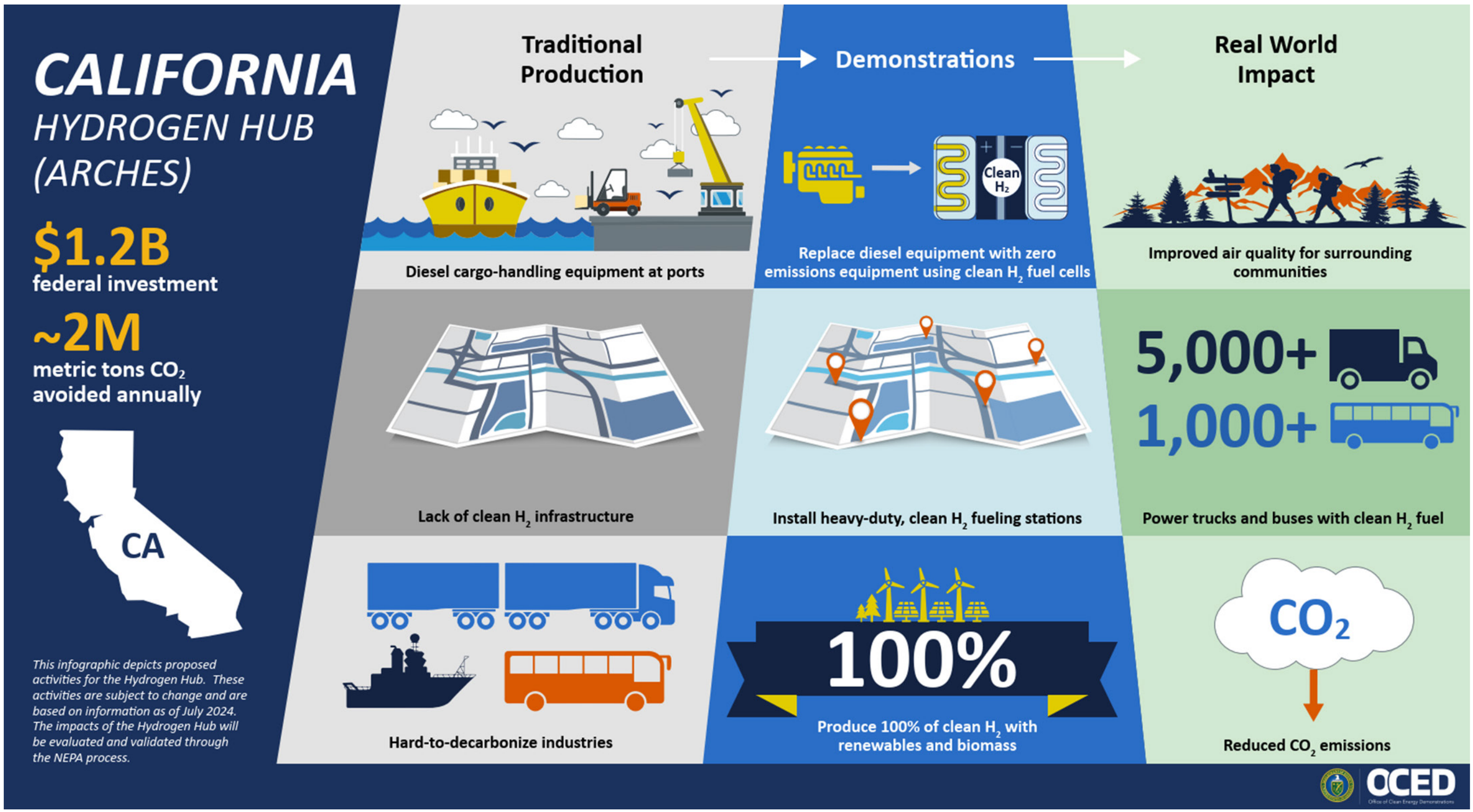
California Hydrogen Hub

The California Hydrogen Hub is proposed to consist of a suite of demonstration projects involving clean hydrogen production, transportation, and end uses located within California.

Project Details: Specific California Hydrogen Hub project details and site locations are in development and will not be evaluated in this EIS but will undergo appropriate tiered NEPA review. This review will consider:

- **Clean Hydrogen Production Technologies**
- **Storage Methods**
- **Delivery Options**
- **End-Use Applications**

More project details available here



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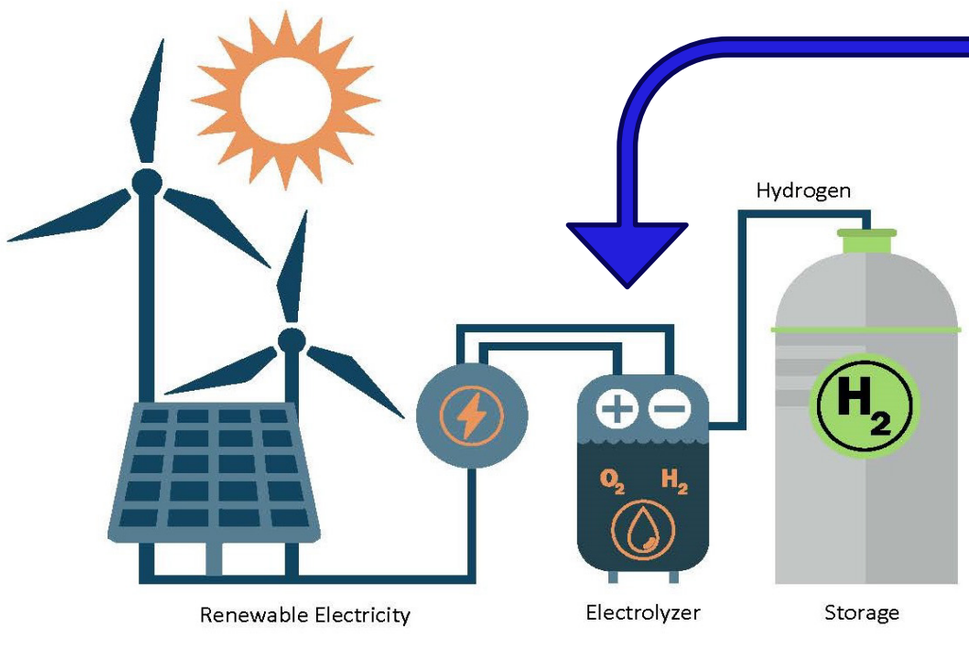
California Hydrogen Hub: Production

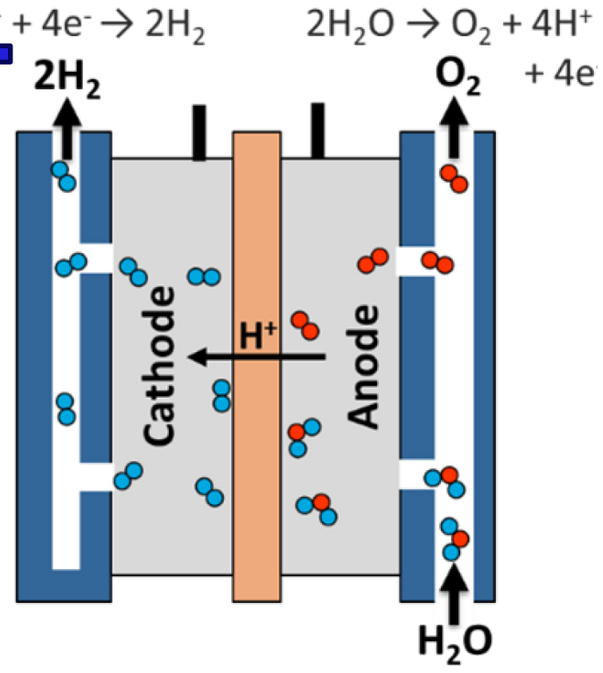
Renewable Hydrogen Production Technologies being considered for the California Hydrogen Hub include:

- **Electrolysis (Water –Splitting)**

What is it?
Electrolysis uses electricity to split water into hydrogen and oxygen. This reaction takes place in a unit called an electrolyzer.

Process
-Like a battery, electrolyzers have two ends (anode and cathode) separated by an electrolyte.
-Applying an electric current causes the water molecules to break down into hydrogen and oxygen.
-Water is the key. The electrolyte helps charged particles from water move between the anode and cathode to make this happen.





Video: Hydrogen Electrolysis 101

- **Biogenic (Waste) Source Production**

What is it?
Biogenic sources of hydrogen come from organic materials like agricultural waste and other plant matter via fermentation.

Process
Converts biomass (wood, agricultural crops, crop residues, animal manure, and organic waste from homes and industries) into hydrogen through various chemical or biological methods.

Potential Waste Sources:

- Food waste
- Wood biomass
- Animal waste
- Slaughter waste
- Municipal waste
- Dairy wastewater
- Industrial wastewater
- Distillery wastewater
- Sewage sludge
- Agricultural waste

Learn more about using biogenic sources to make hydrogen

California Hydrogen Hub: Storage

Hydrogen can be stored in liquid or gas form. Hydrogen Storage Methods being considered for the California Hydrogen Hub include:

- **Above-Ground Tanks:**
  - Above-ground tanks made of steel or other reinforced materials are used to store hydrogen gas at high pressures.
  - This allows higher volumes of hydrogen to be stored in smaller spaces.
  - These tanks are easy to install and maintain.

- **Hydrogen Tube Trailers:**
  - Hydrogen tube trailers are trucks that carry long cylinders filled with compressed hydrogen gas.
  - Hydrogen is compressed to high pressures (180 bar or higher) and stored in these cylinders, which are stacked on a trailer to be transported to where the hydrogen is needed.
  - Tube trailers are flexible and mobile, allowing hydrogen to be delivered to various locations.

California Hydrogen Hub: Delivery

Hydrogen Delivery Options being considered for the California Hydrogen Hub include:

Pipelines:

What are they?	How do they work?	Current use
Pipelines can transport hydrogen gas over long distances.	Hydrogen can be combined with other gases and moved using existing pipelines. Pipelines designed specifically for hydrogen transport are required for higher concentrations of hydrogen.	There are about 1,600 miles of hydrogen pipelines in the U.S., mainly serving industrial areas.

Refueling Stations:

What are they?	How do they work?	Current use
Stations where hydrogen-powered vehicles can refuel.	Hydrogen is stored on-site in high-pressure tanks and dispensed into vehicles. Some stations produce hydrogen on-site using electrolysis. Hydrogen pumped into a vehicle's hydrogen tank is used to power the vehicle's fuel cells.	California has the most developed network of hydrogen refueling stations in the U.S., supporting the growing number of hydrogen fuel cell vehicles.

Trucking:

What is it?	How do they work?	Benefits
Transporting hydrogen gas or liquid using specially designed trucks.	Trucks carry hydrogen in high-pressure cylinders (tube trailers) or as liquid hydrogen in cryogenic tanks.	Allows hydrogen delivery to facilities not serviced by hydrogen pipelines.

Hydrogen Derivatives like Ammonia:

What are they?	How do they work?	Benefits
Chemicals produced using hydrogen, such as ammonia (NH_3), methanol, and synthetic fuels.	Green ammonia is produced by combining hydrogen (from electrolysis) with nitrogen from the air. These derivatives can be used as fuels or in industrial processes.	They offer a more transportable form of hydrogen and can be used in existing infrastructure, reducing greenhouse gas emissions.

California Hydrogen Hub:

End Use Applications

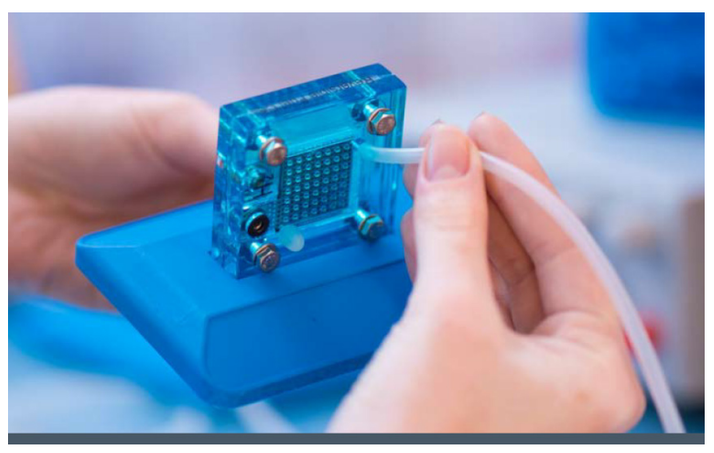
Hydrogen End Use Applications being considered for the California Hydrogen Hub include:

- Transportation
  - Fuel-Cell Electric Vehicles: Trucks, buses, ships, trains, and even aircraft can use hydrogen fuel cells for clean and efficient power. These vehicles produce water vapor instead of gas exhaust.
  - Cargo Handling: Forklifts and cranes at ports can run on hydrogen fuel cells, eliminating combustion emissions from vehicles.

Learn about H2Rescue, a hydrogen fuel-cell electric truck prototype

- Energy Generation
  - Power Plants: Hydrogen can fuel turbines to generate electricity, like natural gas, but with lower emissions.
  - Stationary Fuel Cells: Buildings and industries can use fuel cells to provide clean electricity and heat.

- Industrial Uses
  - Ammonia Production: Hydrogen is vital for making ammonia, a key ingredient in fertilizers and a potential fuel source.



Check out the Stationary Power Fuel Cell Factsheet

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California Hydrogen Hub

EIS Evaluation and Schedule

DOE is preparing an Environmental Impact Statement (EIS) to evaluate the potential impacts associated with types of hydrogen infrastructure and technologies proposed in the California Hydrogen Hub, such as impacts from electricity and water usage and rates of emissions.

DOE anticipates that the EIS would evaluate the potential non-site-specific, direct, indirect, and cumulative impacts during design, construction, operation, and maintenance related to the resource areas depicted below:

- **Energy resources**
- **Land use and infrastructure**
- **Climate change and greenhouse gases**
- **Transportation and accidents**
- **Intentional destructive acts**
- **Atmospheric conditions and air quality**
- **Geology, seismicity and soils**
- **Noise and vibration**
- **Socioeconomic conditions**
- **Hydrologic conditions and water quality**
- **Environmental justice**
- **Human health and safety**

Project Schedule

Scoping comment period → Prepare Draft EIS → Draft EIS comment period → Prepare Final EIS

Dec 18, 2024 - Mar 3, 2025
- Prepare purpose and need
- Publish Notice of Intent
- Conduct scoping meetings

Mar- Oct 2025
- Prepare range of alternatives
- Prepare Draft EIS

Oct - Nov 2025
- Publish Draft EIS – may identify preferred alternative
- Conduct public hearings

April - May 2026
- Publish Final EIS
- Identify preferred alternative (if not already identified)
- Issue Record of Decision

California Hydrogen Hub EIS

Process and Contents

DOE, the lead federal agency, is preparing an EIS to evaluate the potential environmental effects associated with the proposed action of providing financial assistance in support of the California Hydrogen Hub

Notice of Intent (NOI) to Prepare EIS published in Federal Register

December 18, 2024

↓

Public scoping comment period

December 18, 2024, to March 3, 2025

↓

Notice of Availability (NOA) of Draft EIS published in Federal Register

Fall 2025

↓

Draft EIS public comment period

45-days minimum

↓

Notice of Availability (NOA) of Final EIS published in Federal Register

Spring 2026

↓

30-day waiting period

↓

Issue Record of Decision (ROD) with selected alternative

Indicates public involvement opportunity

EIS Includes:

- Purpose and Need for agency action
- Proposed Action
- Action Alternatives
- No Action Alternative
- Description of existing environment
- Evaluation of potential direct, indirect, and cumulative environmental effects
- Identification of mitigation measures, if applicable

Environmental Review Process

DOE will evaluate California Hydrogen Hub funding impacts in stages.

Initial Review

Environmental Impact Statement for the California Hydrogen Hub

- DOE will first evaluate the overall environmental impacts of the California Hydrogen Hub project.
- This includes looking at the general effects of producing, transporting, storing and using hydrogen technologies and infrastructure in California.

This EIS will help DOE decide whether to fund the California Hydrogen Hub. If one of the Preliminary Action Alternatives are selected (that is, funding is approved), the DOE will assess the environmental impacts of site-specific projects in subsequent documentation.

Detailed Review

Environmental documentation for site-specific California Hydrogen Hub projects under consideration for DOE funding

DOE will assess the environmental impacts of each project and make site-specific funding decisions based on findings in other project-specific environmental documents. Consistent with applicable regulations OCED may authorize some proposed Hub sub-projects as interim actions during the preparation of this EIS.

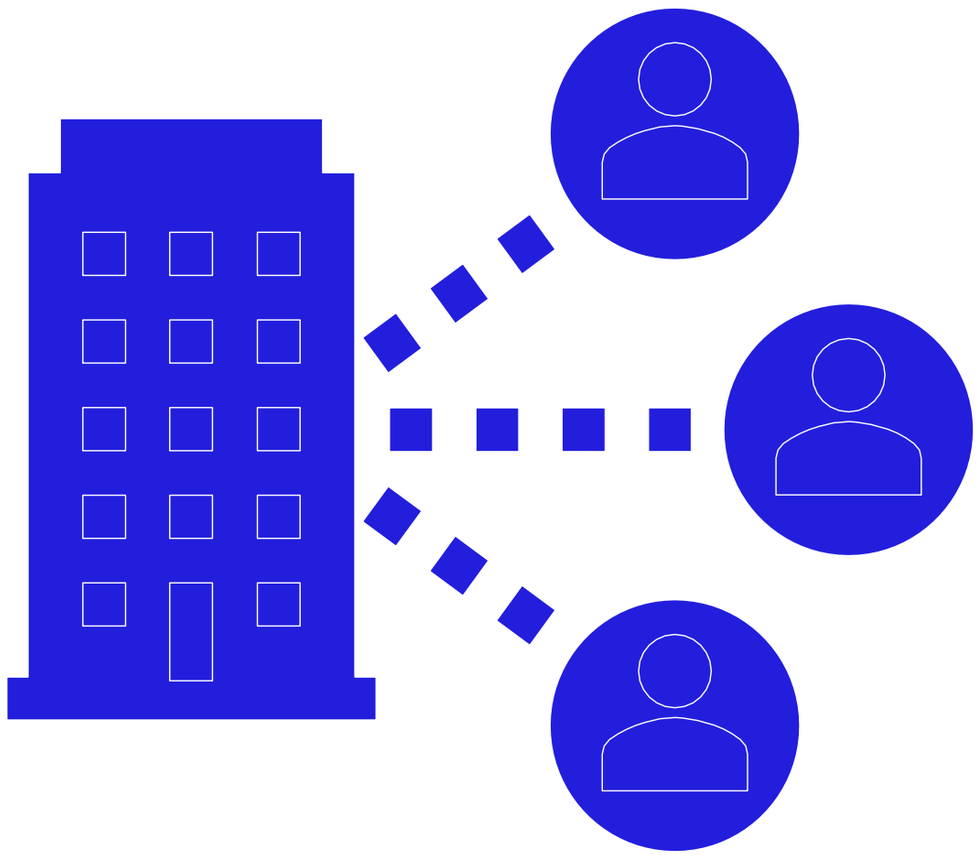
What is Scoping?

Collaboration to define identified issues and alternatives

DOE OCED

Provide information on:

- DOE's proposed action & alternatives
- Resource areas anticipated to be analyzed in the EIS
- The NEPA process



Public

Provide information on:

- The scope of the EIS
- The alternatives being evaluated

Take me to the NOI!

Scoping Period

December 18, 2024 – March 3, 2025

Action and No Action Alternatives

Proposed Action

To **provide federal funding** to support the development of the California Hydrogen Hub, as proposed by ARCHES

Preliminary Action Alternatives

1) **Proposed Action:** DOE funds the proposed California Hydrogen Hub, focusing on the deployment of clean hydrogen technologies and infrastructure.
2) **Expanded Hub Alternative:** DOE funds an expanded version of the Hub, including additional clean hydrogen technologies and infrastructure not currently considered.
3) **Reduced Hub Alternative:** DOE funds a smaller scope of the Hub, supporting only a portion of the proposed action.

No Action Alternative

DOE ***would not provide funding*** to ARCHES for the construction and operation of the California Hydrogen Hub, with the assumption that the Hub would not be developed