Clean Fuels Development in the Southwest and Related Topics

Figure 2

RoundTable Agenda 22 April 2025

Short Round the Room Introductions

Name, Company, Where you sit in the value chain

Discussion Topic:

Catalyzing Connections: Clean Hydrogen and Beyond in the Southwest, Workshop January 2025

Led by Neha Chhetri, AzCaNE

Roundtable Prompts

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In the spirit of co-opetition, the Industry Roundtable aims to build community and establish a shared understanding of challenges, opportunities, gaps, and needs for a commercially viable clean hydrogen economy in the Southwest and related means to achieve deep decarbonization

Figure 2

ROUNDTABLE 22 APRIL 2025

Roundtable Prompts

- Question for Neha and/or choose from the Prompts
- Your thoughts on what kinds of convenings—like the Workshop—are most valuable for building shared understanding and regional alignment. Feel free to reflect on formats, topics, or even gaps you see in how these discussions are currently structured.
- As we think about future opportunities for engagement, we invite you to share who you are most interested in connecting with—and what kinds of conversations or partnerships you would like to see more of.
- We also welcome anyone who would like to share exciting news—whether it is a recent milestone, a new project, or emerging momentum you are seeing in clean hydrogen or broader efforts toward carbon neutrality. These glimpses of progress help us all stay inspired and informed.

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DISCUSSION TOPIC

Catalyzing Connections: Clean Hydrogen and Beyond in the Southwest, Workshop January 2025

Discussion Lead: Neha Chhetri

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January 2025 Clean Hydrogen and Beyond Workshop

Summary and Outcomes

University of Arizona College of Engineering, Scottsdale Center
7135 E Camelback Road, Suite 204
Scottsdale, AZ, 85251
Room: Bear Down Conference Center

Workshop Intended Outcomes

- Support informed decisions on decarbonization strategies
- Explore innovative solutions to address challenges
- Foster collaboration and strengthen connections among diverse
- stakeholders

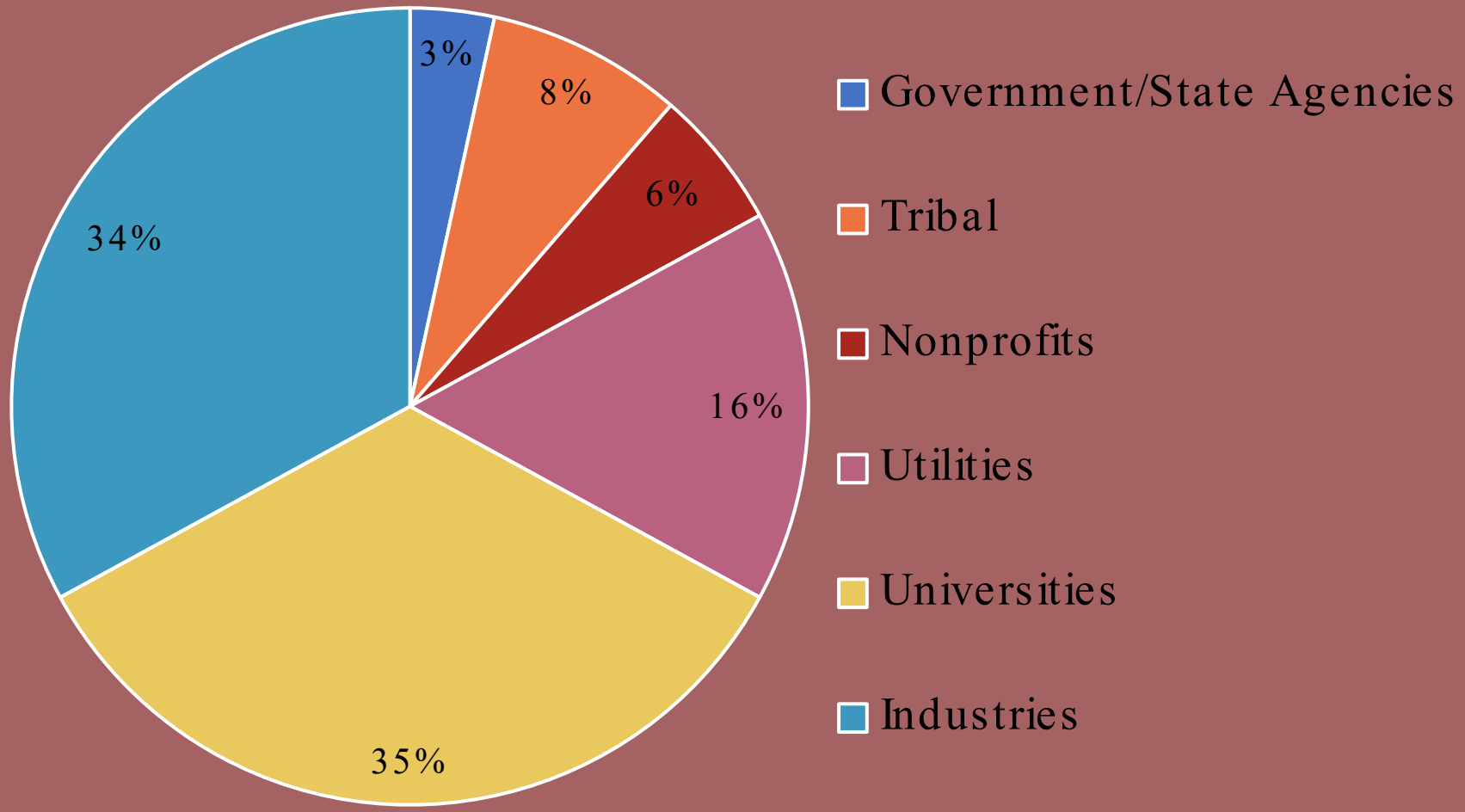
Workshop Panels

- **Panel 1** *Water's Role in Clean Hydrogen and the Energy Transition*
- **Panel 2** *The Indispensable Role of Mining in Decarbonizing Energy and Transportation Sector*
- **Panel 3** *Utilizing Bio Waste*
- **Panel 4** *Carbon Capture and Storage and Greenhouse Gas Accounting*

Workshop Panels Continued

- **Panel 5** *Regional Hydrogen Development*
- **Panel 6** *Workforce Development*
- **Panel 7:** *Industry Perspectives: Driving Clean Energy Solutions and Innovation*

Participation Percentage by Sector



Panel 1: *Water's Role in Clean Hydrogen and the Energy Transition*

- **Presentation**: Sarah Porter (*Arizona State University*)
- **Moderator:** Greg Hitt (*University of Arizona*)
- **Panelists**: Shane DePinto (*Salt River Project*),
  Sandy Fabritz (*Freeport- McMoRan*),
  Sarah Porter (*Arizona State University*)

Panel 1: Workshop Takeaways

- With just **0.2-0.5%** of AZ's annual water use, the state could supply enough clean H_2 to meet 2050 projections for **5%** of the state's electrical demand and **100%** of freight trucking
- Water use modest compared to other industries
- Demand manageable via voluntary reallocation of sustainable water supplies
- Could contribute towards AZ's water sustainability and clean energy transition

Panel 1: Workshop Takeaways Continued

1. Withdrawing groundwater for any use results in aquifer depletion unless the withdrawal is offset by recharge.

   In contrast, water from rivers and streams (surface water) and reclaimed wastewater considered "renewable" water supplies

2. The sustainability of reallocating water from agricultural uses to clean hydrogen production depends primarily on the source of supply

3. Reclaimed water is expensive compared to other water supplies and in high demand

4. Even with relatively expensive sustainable water supplies, producing clean hydrogen may still be economically feasible

5. Arizona has natural and built infrastructure that may be helpful

Panel 2: *The Indispensable Role of Mining in Decarbonizing Energy and Transportation Sector*

- **Moderator:** Misael Cabrera (*University of Arizona*)
- **Panelists:** Mark Chalmers (*Energy Fuels*),
  Francis McAllister (*Freeport-McMoRan*),
  Pat Risner (*South 32 Hermosa) sent a written statement to read*

Panel 2: Workshop Takeaways

- Mining of the future is centered on sustainability, transparency, and community benefit
- Mined minerals like copper and manganese are essential to the energy transition
- South32 project would mine manganese—currently 100% imported—highlighting urgency of domestic production
- Permitting timelines can span decades; streamlining is needed without compromising public engagement or environmental standards

Panel 3: *Utilizing Bio Waste*

- **Presentation**: Matt Tomich (*Energy Advisors*)
- **Moderator:** Matt Tomich (*Energy Advisors*)
- **Panelists:** Ashley Elixson (*Dairy Farmers*), Daniel Hunter (*Ameresco*), Elvy Barton (*Salt River Project, invited*)

Panel 3: Workshop Takeaways

- Agricultural and forestry residuals can be a challenge to manage
- However, new technologies like biochar and biofuels present new opportunities to turn these previously discarded waste streams into beneficial products
- Innovative financing structures will be critical to advance biochar and biofuels

Panel 3: Workshop Takeaways Continued

- **Collaboration:** Key in the "waste-to-value" arena between industry and government for financeable long-term feedstock and offtake agreements
- **Biogas/RNG Challenges:** While technology is proven and scalable, lack of supportive policies, incentives, and certainty hinder private-sector investment in this long-term infrastructure
- **Waste to Value Projects Opportunity:** Monetizing non-energy benefits (carbon reductions, nutrient/water recovery, forest fire mitigation—biochar) stabilizes project-level economics and boosts investment attractiveness

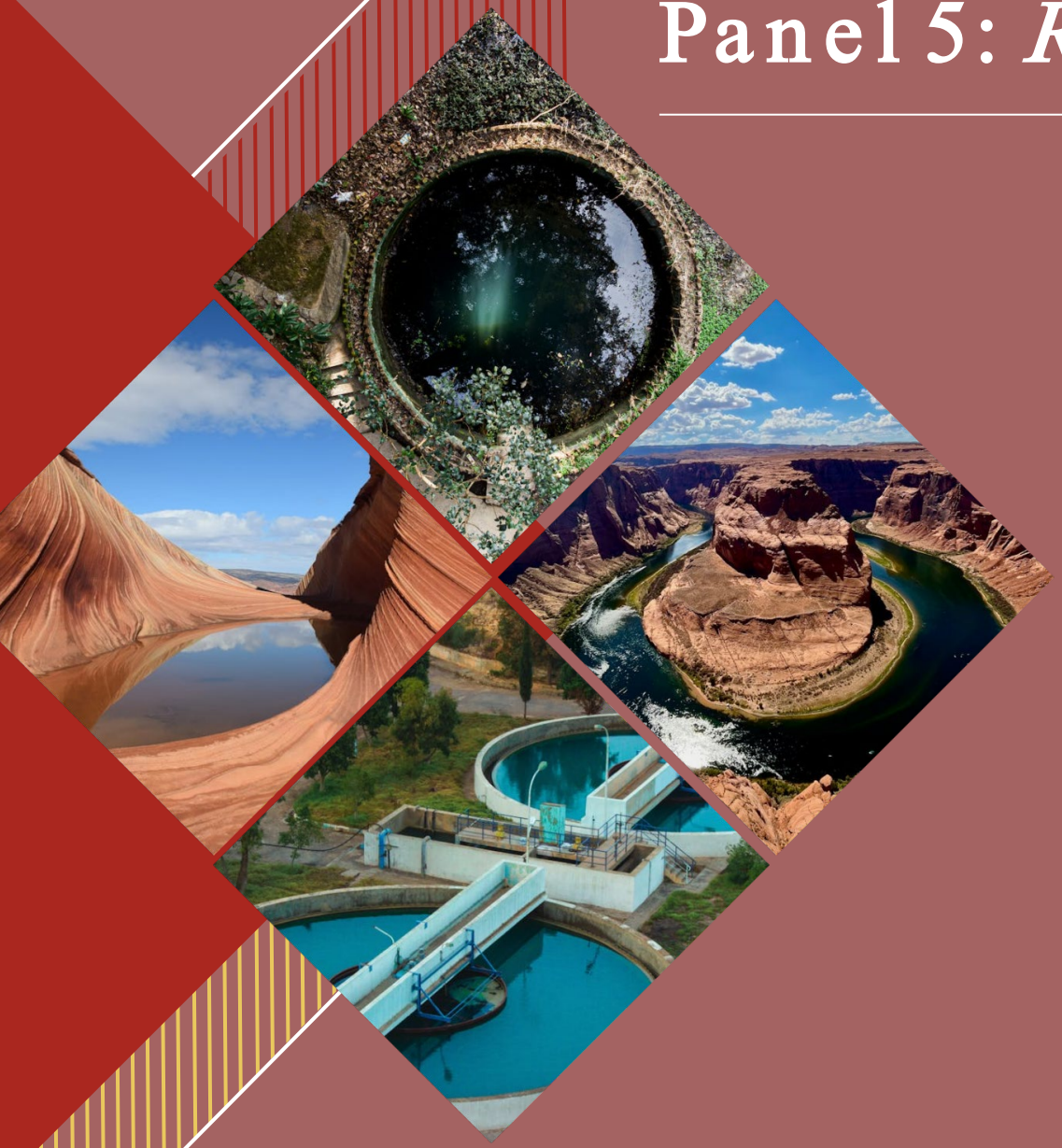
Panel 4: *Carbon Capture and Storage and Greenhouse Gas Accounting*

- **Presentation**: Gary Dirks (ASU)
- **Moderator:** Andrew Browning (*HBW Resources*)
- **Panelists:** Roger Angel (*University of Arizona*),
  Gary Dirks (*Arizona State University*),
  Lynne L'Esperance (*Guidehouse*),
  Andy Hawkins (*Navajo Transitional Energy Company*),
  Richard Rushforth (*Northern Arizona University)*

Panel 4: Workshop Takeaways

- **Momentum in the Southwest**: ASU-led team awarded **$11.2M** for Southwest Regional DAC Hub; part of broader DOE CarbonSAFE and IIJA initiatives.
- **Two Core Capture Pathways**:
  - **Point-source capture** from industrial sites.
  - **Direct Air Capture (DAC)** technologies using solid sorbents, liquid solvents, and modular solar units.
- **Strategic Sites**:
  - **San Juan Basin (NM)** – Saline formations with high storage potential.
  - **St. Johns Dome (AZ)** – Natural CO_2 reservoir with helium co-product.
  - **Price, UT** – Coal-bed methane field with large pore space capacity.
- **Challenges & Considerations**:
  - **Water and energy use optimization**
  - Community engagement and permitting
  - Long-term scalability and cost-effectiveness
- Climate Pollution Reduction Grants funding **Greenhouse Gas Accounting** in AZ: Effort led by Northern Arizona University

Panel 5: *Regional Hydrogen Development*



- **Presentation**: Tessa Weiss (*Rocky Mountain Institute*
- **Moderator:** Danielle Vitoff (*Guidehouse*)
- **Panelists:** Vijay Atavane (*SoCalGas*), Andrew Martinez (*California Air Resources Board*), Brett Perlmann (*HyVelocity*), Tessa Weiss (*Rocky Mountain Institute)*

Panel 5: Workshop Takeaways

- Many regions across US see potential for a clean hydrogen market, but face disconnect between competitive production, storage, and demand centers
- Given this, midstream hydrogen infrastructure will be essential to spur market growth and offer resilience of clean hydrogen supply
- In AZ, connection to larger demand in CA can promote development of its hydrogen industry
- While AZ sees competitive production and storage opportunities, it lacks the same strength of demand for hydrogen.

Panel 5: Workshop Takeaways Continued

- Strong CA presence with CARB and SoCalGas reaffirming commitments to clean hydrogen deployment.
- SoCalGas highlighted Angeles Link:
  - Proposed pipeline system to deliver clean hydrogen to hard-to-electrify sectors across CA, including transportation, power, and industry.
- Project advancing to Phase 2, with route selection, engineering, and stakeholder engagement underway

Panel 5: Workshop Takeaways Continued

- HyVelocity supported by ~$1.2B in federal funding as a Regional Clean Hydrogen Hub.
- Leverage existing Gulf Coast infrastructure while building new pipelines and liquefaction facilities to support industrial hydrogen use and carbon capture.
- Scale clean hydrogen production to meet regional demand, strengthen U.S. energy security, and maintain global competitiveness.
- Mobilize private investment to create up to 45,000 jobs, transition oil and gas workers, and decarbonize hard-to-electrify sectors like trucking, refining, and steel.

Panel 6: Workforce Development

- **Moderator:** Thomas Acker (*Salt River Project*)
- **Panelists:** Jacob Evenson (*Boilermakers 627*), Heather Moore (*University of Arizona)*

Panel 6: Takeaways Continued

- **H_2EDGE:** National workforce initiative led by Electric Power Research Institute and GTI Energy, with partners including UArizona and SRP
- Focused on preparing hydrogen-ready workforce through university and professional training programs
- Training content covers 4 key hydrogen pillars: **production, delivery, storage, and end-use**
- Training has safety integrated throughout and emphasis on reaching diverse, transitioning, and underserved worker populations

Panel 6: Takeaways

- Jacob Evenson highlighted the opportunity for fossil fuel workers to retrain for careers in hydrogen and carbon capture (CCUS) sectors, supporting a just transition
- Up to $100M in support for university curricula, professional training, and inclusive workforce development

Panel 7: *Industry Perspectives: Driving Clean Energy Solutions and Innovation*

- **Presentation**: Chris Barker (*Hyve 1*)

- **Moderator:** Ellen Stechel (*Arizona State University*)
- **Panelists:** Chris Barker (*Hyve 1*), Alexia Bednarz (*Nikola*), Adam Schiche (*Tallgrass*), Joe Varela (Southwest Gas)

Panel 7: Workshop Takeaways

- Clean hydrogen will play an important role in decarbonizing heavy-duty transportation.
- The impact of heavy-duty trucks on air pollution and carbon emission is not to be understated; equivalent of 23 passenger cars on the road for a year in terms of CO_2.
- Hydrogen stations are being built out in CA as mobile solutions to bridge the infrastructure gap.
- More resources are needed on H_2 infrastructure.

Panel 7: Workshop Takeaways

- Updated **45V (clean hydrogen production tax credit)** and **45Q (carbon capture credit)** guidelines were discussed
- Included: eligibility rules, lifecycle emissions modeling, and compliance timelines

- Insights from Germany, Chile, Namibia, and Nordic countries, noting the importance of community engagement, national strategies, and public trust in successful hydrogen adoption.
- Regulatory complexity and uncertainty around how current administration may revise or relax these requirements.

Panel: Workshop Takeaways

- Large-scale hydrogen production in Western AZ aims to leverage solar, geothermal, and nuclear power, with $8B in investment for production, use, and infrastructure
- Scaling H_2 infrastructure in the Southwest requires cross-sector collaboration and public trust
- RNG and H_2 blending face technical, regulatory, and financing challenges but offer decarbonization potential

Overall Workshop Takeaways

- Audience feedback indicated that they learned a lot, with panels offering both breadth and depth across a wide range of topics.
- Strong participation from universities, industries, and utilities
- Internal feedback emphasized efforts to engage more policymakers

Thank you

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Thank you for your participation

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