Nevada Conservation League

Nevada's Path to Clean Energy: Emphasizing Thoughtful Hydrogen Integration

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About Nevada Conservation League (NCL)

Mission: As the political voice of Nevada’s conservation community, Nevada Conservation League (NCL) works to protect our climate, air, water, land, and health by translating conservation values into political and policy priorities that we actively promote so all Nevada’s communities can thrive.

Role: Major voice in state policy for over 23 years, focusing on conservation and clean energy advocacy.

Clean Energy Commitment:

- Long-standing involvement in shaping state energy policies.
- Collaboration with stakeholders to promote and implement clean energy solutions.

Hydrogen - Legislative Context

- NCL's Role in Recent Hydrogen Legislation
  - Participated in last session's hydrogen-related bills.
  - Partnerships with organizations and experts like EDF to ensure responsible energy policies.

- Hydrogen: Opportunities and Cautions
  - Potential benefits of hydrogen as a clean energy source.
  - Critical considerations: Production methods and end-use applications.

Nevada's Clean Energy Progress & Goals

- Progress Towards Nevada’s Clean Energy Goals
  - In 2019, we established goals to reduce Nevada’s GHG emissions 28% by 2025 and 45% by 2030
  - Nevada’s first RPS passed in 2001, less than 1% from renewable sources. Now, we have an RPS of 50% by 2030 and 100% clean energy by 2050.
  - Nevada’s rich solar and geothermal resources.

- Continued Action & Progress:
  - Reduce Dependency on Imported Fossil Fuels
    - Economic impact of volatile Methane (natural) gas prices on Nevadans.
    - Emphasis on using in-state clean energy resources to create a stable energy economy, lower bills, and reduce pollution
  - Maximize Federal Investments in Nevada’s Clean Energy

How to Make Clean Hydrogen:
The Necessary Climate Guardrails & the Opportunities for End-uses

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Environmental Defense Fund

Hydrogen production methods

Fossil fuel pathways make up 99% of today's H_2 production in the U.S. (and world).

- 91% “High Carbon” Natural Gas or Coal (feedstock and energy source)
- 9% “Low Carbon” Fossil Fuels + CCUS
- <0.2% “Near Zero Carbon” Renewable Electricity

Source: 2022 estimates of U.S. hydrogen capacity from Rystad

Climate impacts of 'clean' hydrogen

The climate impacts of hydrogen depend on several factors.

Green Hydrogen	Blue Hydrogen
Sourcing of Electricity	Carbon Capture & Sequestration
Hydrogen Emissions	Methane Emissions
End Use	Hydrogen Emissions
	End Use

See new EDF paper by Sun et al. 2024 for more information

Green Hydrogen:
Sourcing of Electricity

Hydrogen energy intensity

Hydrogen can be 3-7x as energy intensive as direct electrification.

- Passenger Car
    - Range: 1x-9x more energy intensive than direct electrification.
    - Median: 3x more energy intensive than direct electrification.
- Heavy-Duty Truck
    - Range from 2x-9x more energy intensive than direct electrification.
    - Median: 4.1x more energy intensive than direct electrification.
- Bus
    - Range from 2x-9x more energy intensive than direct electrification.
    - Median: 3.9x more energy intensive than direct electrification.
- Home Heating
    - Range from 3x-16x more energy intensive than direct electrification.
    - Median: 7x more energy intensive than direct electrification.

Source: EDF

Sourcing of electricity for green H2

The 3 pillars are critical to the long-term success of the H2 industry.

1. Incrementality
2. Temporality
3. Deliverability

Blue Hydrogen:
CCS
Methane Emissions

Drivers of blue H2 emissions

CCS rates and upstream methane leakage strongly impact GHG impact.

This is due to:

- Methane leakage & venting throughout natural gas supply chain
    - Highly variable regionally (<1 to 5%+)
- Carbon capture rate and storage efficiency
    - Range in capture technologies (60 to >95%)

Methane emissions rates in the U.S.

Methane emissions from blue H2 will depend on where the methane comes from.

GREET Model GHG Intensity for Example Basins/Sub-Basins – SMR + 95% CC

Example Basins/Sub-basins	GHG Intensity (kg CO2e/kg of H2)
NE Marcellus Basin	2.2
GREET 2022 Lower Bound	2.6
Current GREET	2.8
SW Marcellus Basin	3.1
Permian Basin	4.1
GREET 2022 Upper Bound	5.2
Uinta Basin	6.5

*Basin rates include only natural gas- & co-producing wells; Data from Barkley et al. 2023; Argonne 2022; Zhang et al. 2020; Ren et al. 2019; Lin et al. 2021

Hydrogen Emissions

How hydrogen warms the climate

There is scientific consensus that hydrogen is an indirect greenhouse gas.

- Around 30% of emitted hydrogen is oxidized after a few years
- Methane lasts longer because there is less OH.
- Ground-level Ozone increases from chain of reactions triggered by production of Hydrogen.
- High-altitude Water Vapor increases in the stratosphere.

Short-term impacts of methane and hydrogen

Though short-lived, the climate impact of hydrogen emissions is potent. Pound for pound, its warming potential is about 40 times greater than carbon dioxide in the first 20 years after its release.

Climate impacts

Methane and hydrogen emissions can make blue hydrogen worse for the climate in the near-term than the fossil fuel systems they are replacing.

Source: Ocko and Hamburg 2022

End Uses

Hydrogen end users

Hydrogen can be an inefficient use of clean energy if better options are available.

Questions?

Recommendations

- Uphold the 3 pillars for green hydrogen
- Utilize actual CCS rates, not nameplate efficiencies
- Accurately account for methane leakage, including basin-specific numbers
- Include hydrogen emissions in climate impact assessments; require leakage prevention plans
- Calculate both near- and long-term warming impacts
- Regulate GHG & air pollution associated with hydrogen production, management & use
- Deliver hydrogen to highest-value end uses