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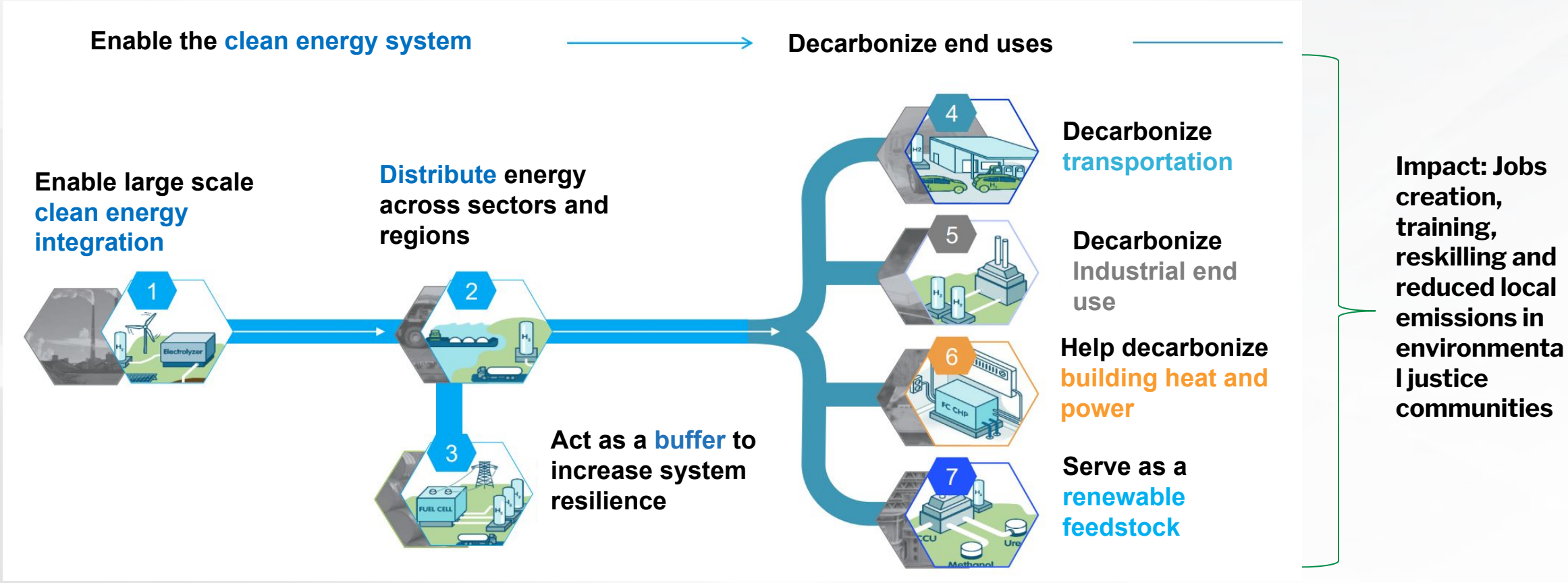
# Meeting Carbon and Equity Goals through Zero Carbon Hydrogen

# To reach decarbonization goals, zero carbon hydrogen will be required to help mitigate a variety of challenges

Hydrogen is a versatile energy carrier that can play a significant role in decarbonization across the value chain.



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# Demand for zero carbon hydrogen is growing, but infrastructure lags

The market for zero carbon hydrogen is projected to expand up to 10-fold by 2050; addressing cost and infrastructure challenges can accelerate that timeline and support decarbonization goals.

**Zero carbon hydrogen is more expensive today,** dependent on electricity price, efficiency, utilization and electrolyzer capex. The price difference between gray hydrogen (close to a$1/kg) and clean hydrogen (close to $3/kg) is expected to narrow by 2030 and close by 2040. Policy support would advance that timeline significantly.

**Infrastructure investment is needed to support the development of a hydrogen economy** with the costs of transportation and storage further challenging the economics. Hydrogen is three times less energy dense on a volumetric basis than natural gas, making transport by ship or truck and storage more expensive.

**Certain end uses will require new technology or conversion.** For instance, converting existing industrial processes to use zero carbon hydrogen as a fuel will require investments in the infrastructure currently serving the plants.



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# Hydrogen Hub funding will help address these challenges

Infrastructure, Investment and Jobs Act (IIJA): No later than 180 days after the date of enactment of the Infrastructure Investment and Jobs Act – May 2022– the Secretary shall solicit proposals for regional clean hydrogen hubs. $8 B is authorized from the period of FY 2022-2026.

Selection criteria:

- Feedstock diversity—To the maximum extent practicable— "(i) at least 1 regional clean hydrogen hub shall demonstrate the production of clean hydrogen from fossil fuels; "(ii) at least 1 regional clean hydrogen hub shall demonstrate the production of clean hydrogen from renewable energy; and "(iii) at least 1 regional clean hydrogen hub shall demonstrate the production of clean hydrogen from nuclear energy.
- End-use diversity—To the maximum extent practicable— "(i) at least 1 regional clean hydrogen hub shall demonstrate the end-use of clean hydrogen in the electric power generation sector; "(ii) at least 1 regional clean hydrogen hub shall demonstrate the end-use of clean hydrogen in the industrial sector; "(iii) at least 1 regional clean hydrogen hub shall demonstrate the end-use of clean hydrogen in the residential and commercial heating sector; and "(iv) at least 1 regional clean hydrogen hub shall demonstrate the end-use of clean hydrogen in the transportation sector.
- Geographic diversity—To the maximum extent practicable, each regional clean hydrogen hub— "(i) shall be located in a different region of the United States; and "(ii) shall use energy resources that are abundant in that region.
- Hubs in natural gas-producing regions—To the maximum extent practicable, at least 2 regional clean hydrogen hubs shall be located in the regions of the United States with




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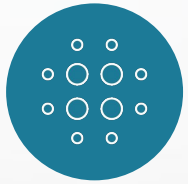
# Zero carbon hydrogen produced from nuclear power is uniquely positioned in Illinois

**Superior economics**

Zero carbon hydrogen from Nuclear currently beats green hydrogen production on a levelized cost basis in most regions of the country

**Low barriers to implementation**

Nuclear plants require no siting or permitting – unlike renewables – and offer a secure and steady production source



**Scalable and iterative**

Electrolyzer capacity can be modularly ramped onto nuclear assets from pilot stage to at-scale production – allowing iterative electrolyzer installation cost-downs and quick production scale-up with new

**Advantageous end-uses**

There are certain end-uses that benefit from high heat industrial processes – such as synfuels– that create a synergistic relationship with nuclear sites

**Enhanced criticality of nuclear assets**

With increasing renewables intermittency, electrolyzers can also be used to add flexibility to nuclear assets to improve value in a decarbonizing world

***Constellation has been exploring hydrogen production at nuclear plants for many years and was awarded DOE funding to demonstrate nuclear hydrogen production at Nine Mile Point Nuclear Power Station for the performance period 2020-2023***



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# Investing in hydrogen infrastructure supports the objectives of Chicago's Climate Action Plan

The benefits of being awarded the funding for the hydrogen hub vary depending on scale and implementation approach, but include:

## Emissions Reductions

*Emissions reductions, particularly in EJ communities, result from replacing fossil end uses with hydrogen, including heavy duty fuel cell electric vehicles*

## Jobs

*Construction, development and ongoing jobs, including engineering*

## Community Investment

*Redevelopment, education and job training programs*



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**Regarding Critical Infrastructure, Equity & Resilience, to achieve Chicago's Carbon & Equity goals, a critical obstacle to overcome…**

***is bringing diverse stakeholders together to develop the leading hydrogen hub proposal and attract federal dollars that will establish a hydrogen infrastructure network to advance the climate leadership of the state in a sustainable way by enabling jobs, reducing local emissions, and improving equity.***



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