

Building To Net- Zero:

A U.S. Policy Blueprint for
Gigaton-Scale CO₂ Transport
and Storage Infrastructure

AFL-CIO

AMERICA'S UNIONS

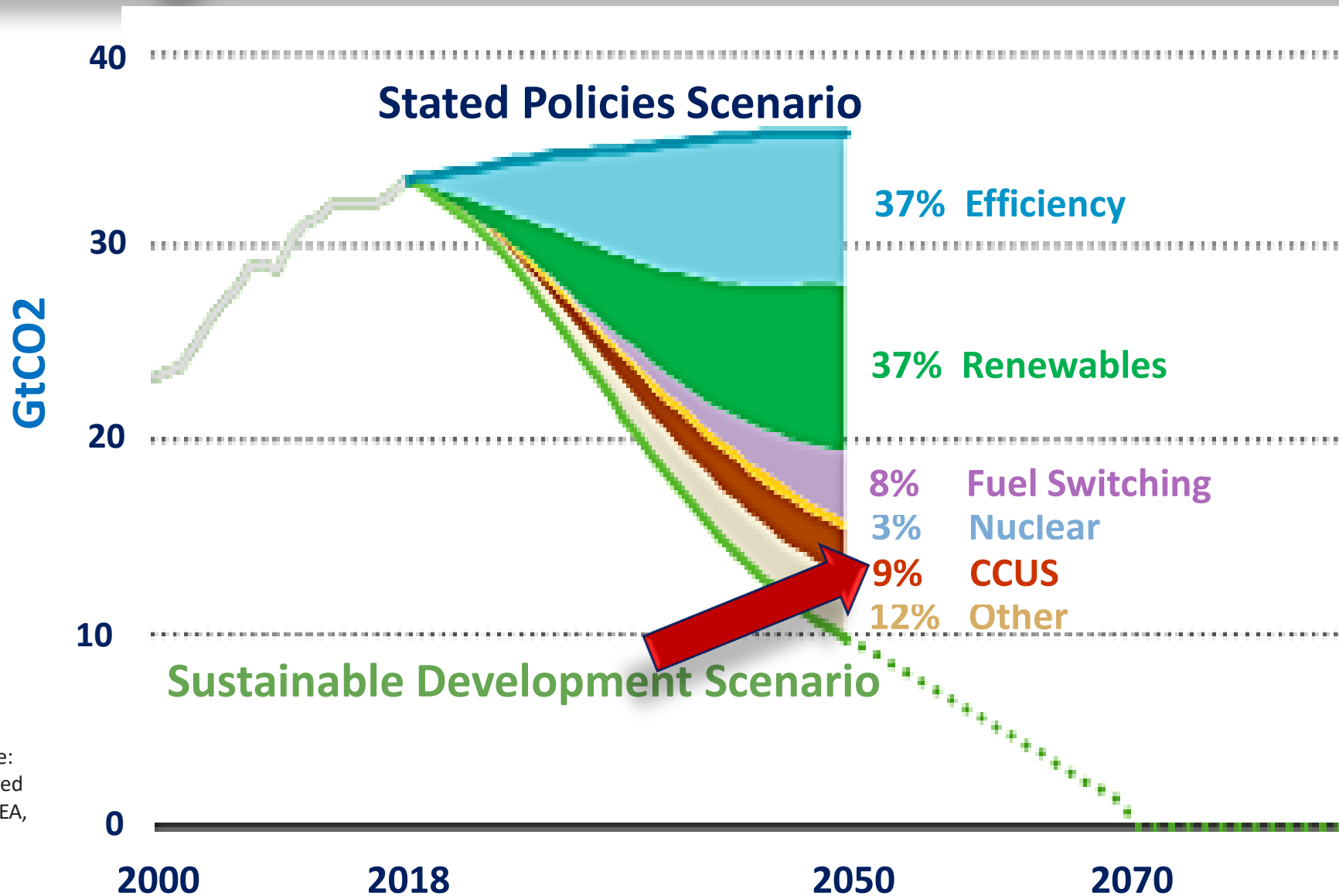


**ENERGY FUTURES
— INITIATIVE —**





Energy-Related CO₂ Emissions Reductions by Source in IEA Sustainable Development Scenario



“Reaching net zero will be virtually impossible without CCUS”

IEA, 02/20



ENERGY FUTURES INITIATIVE

Stanford SCHOOL OF EARTH, ENERGY & ENVIRONMENTAL SCIENCES Stanford Center for Carbon Storage

Stanford ENERGY Precourt Institute for Energy

CCS Can Help Manage the Challenges of Integrating Intermittent Renewables

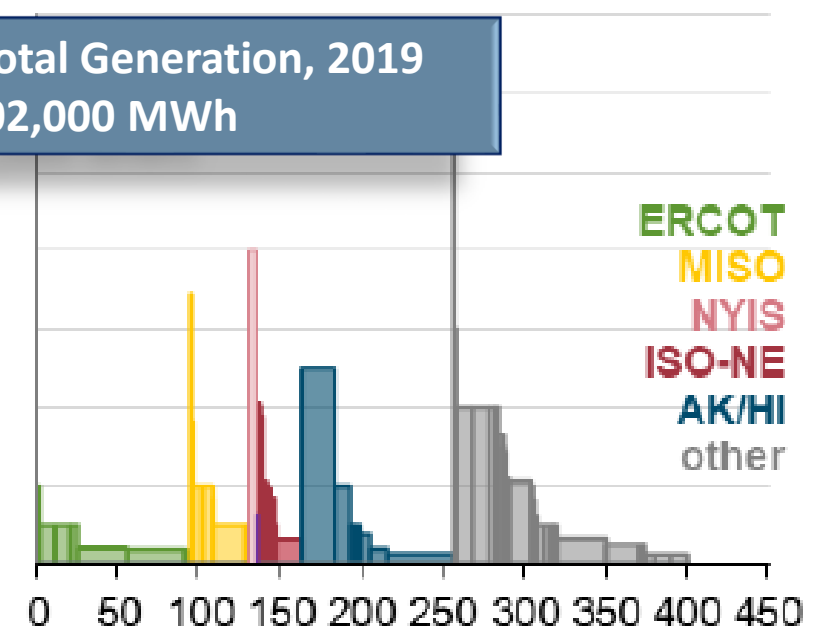
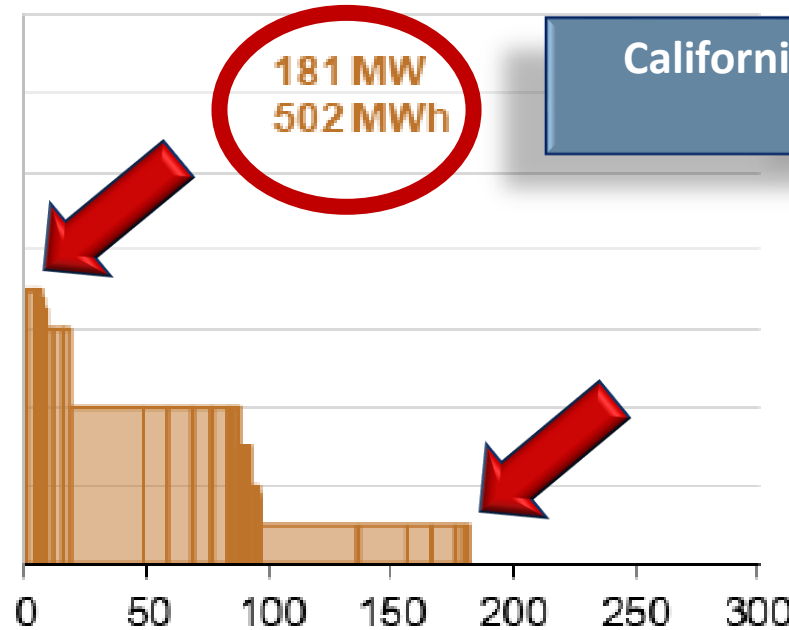
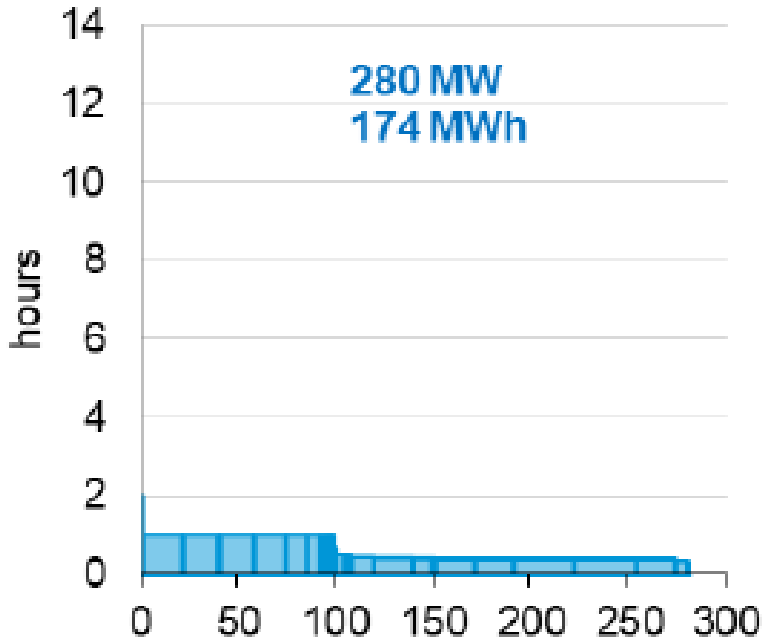
Over the course of a year large-scale dependence on both wind and solar will result in significant capacity shortfalls. Back-up options

Installed Battery Storage Capacity/Duration, 2019

PJM

CAISO

rest of U.S.



Hourly trends in solar and wind capacity factors in CA for 2017 aligned to normalized variation in hourly load relative to peak daily load

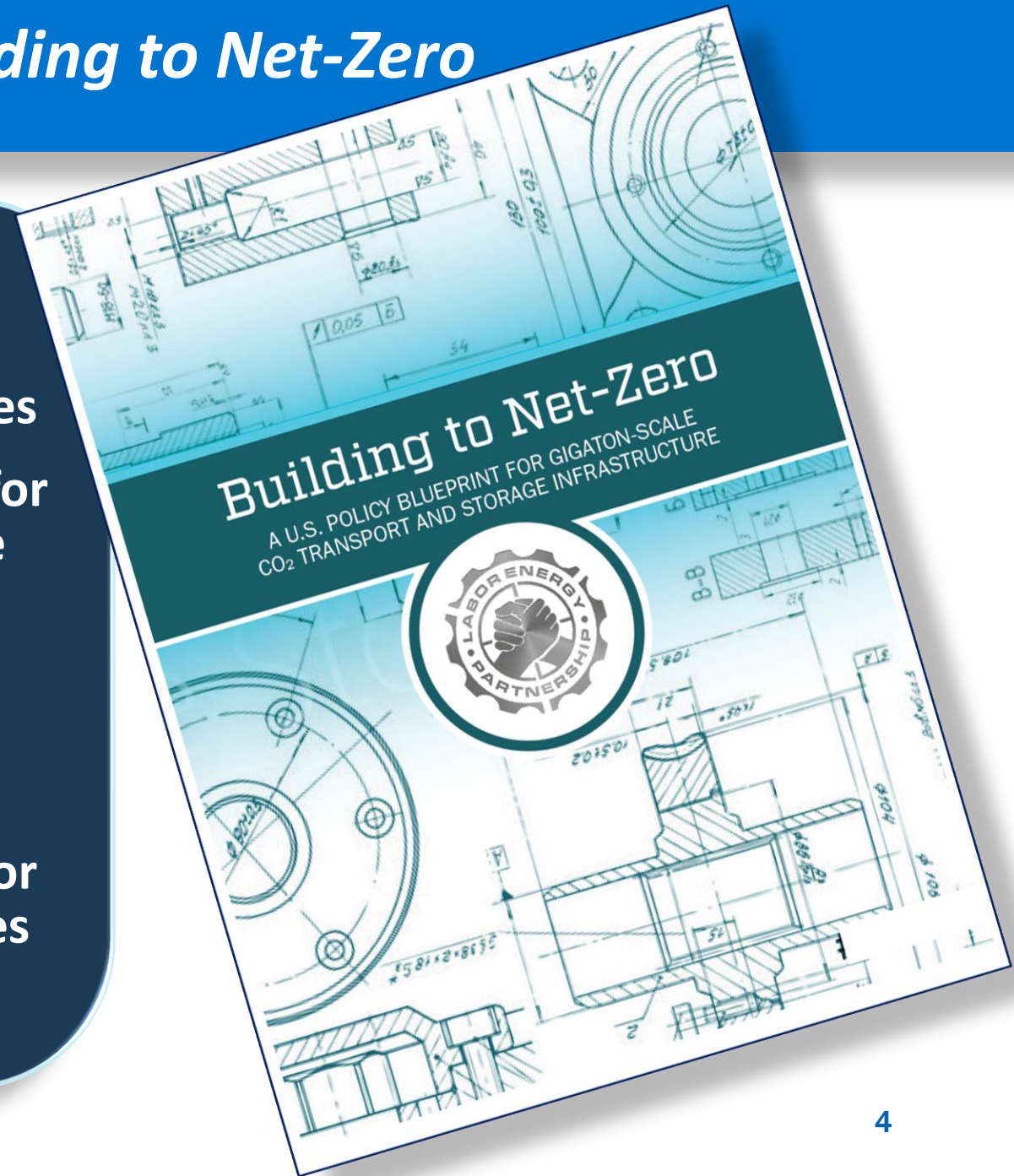
Source: CAISO data, EFI analysis

Source: EIA, 2020



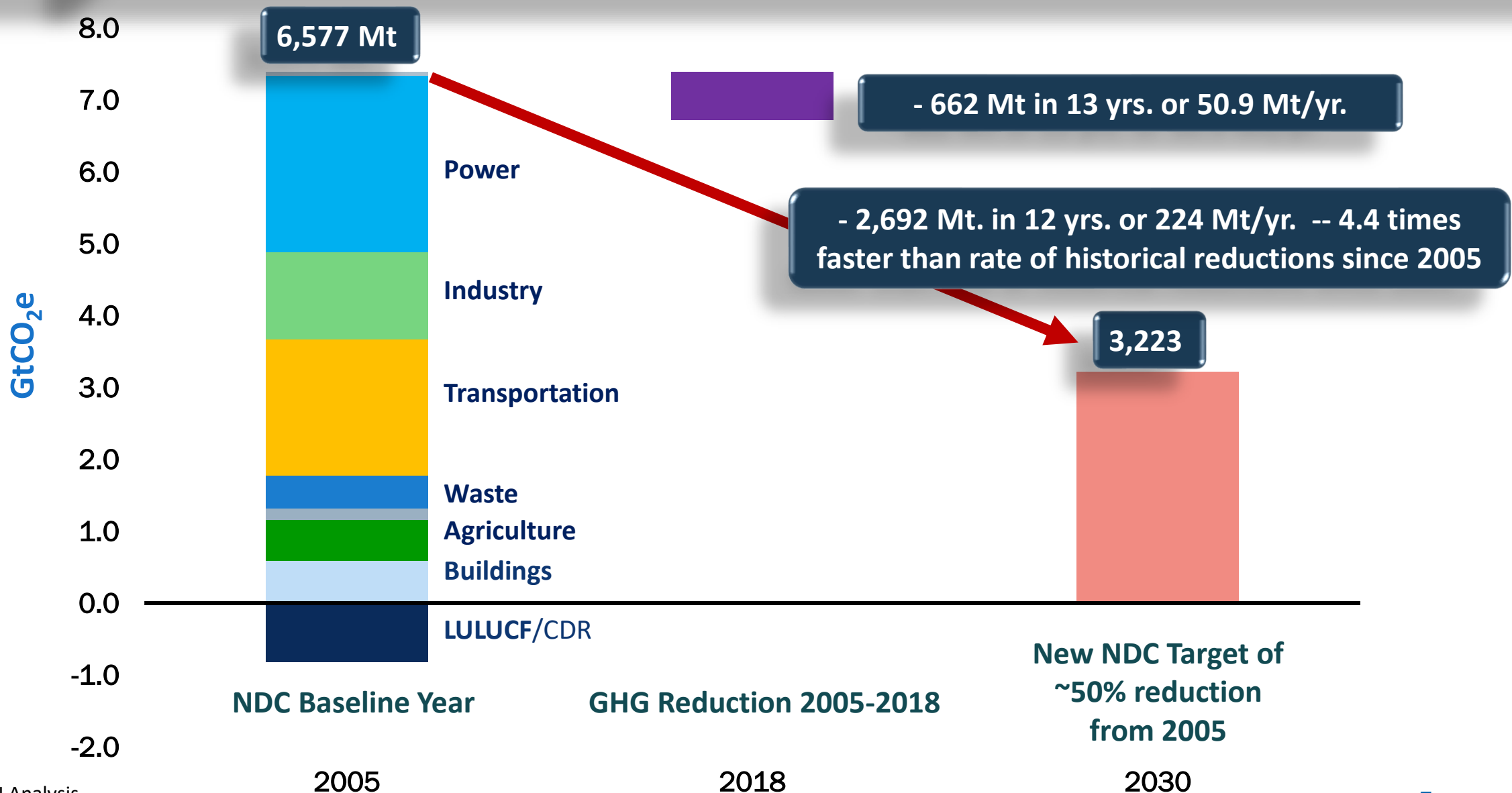
About *Building to Net-Zero*

- ✓ Collaborated with union partners to understand labor impacts of policies
- ✓ Conducted regional case studies for CCS hubs in the Ohio River Valley, the Gulf Coast, and Wyoming
- ✓ Identified opportunities and challenges of deploying CO₂ infrastructure
- ✓ Made policy recommendations for the Legislative and Executive Branches





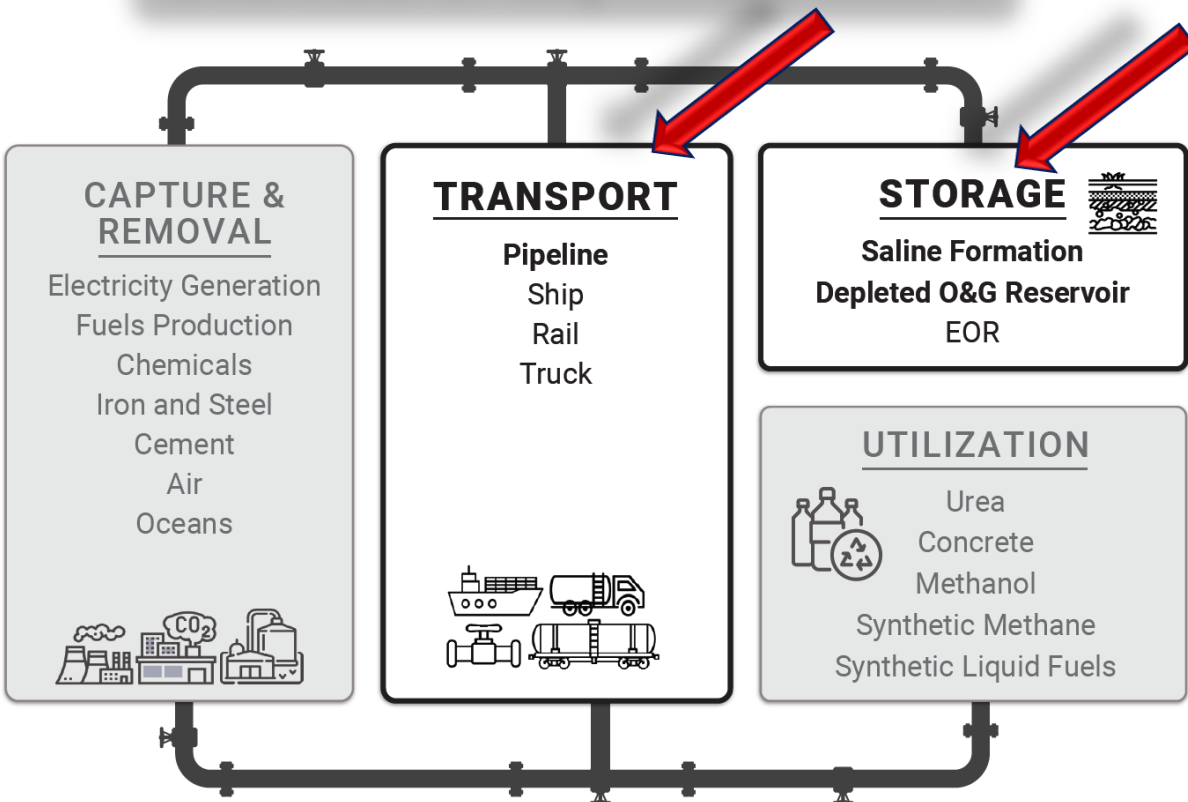
Meeting the NDC target will take rapid, economywide decarbonization



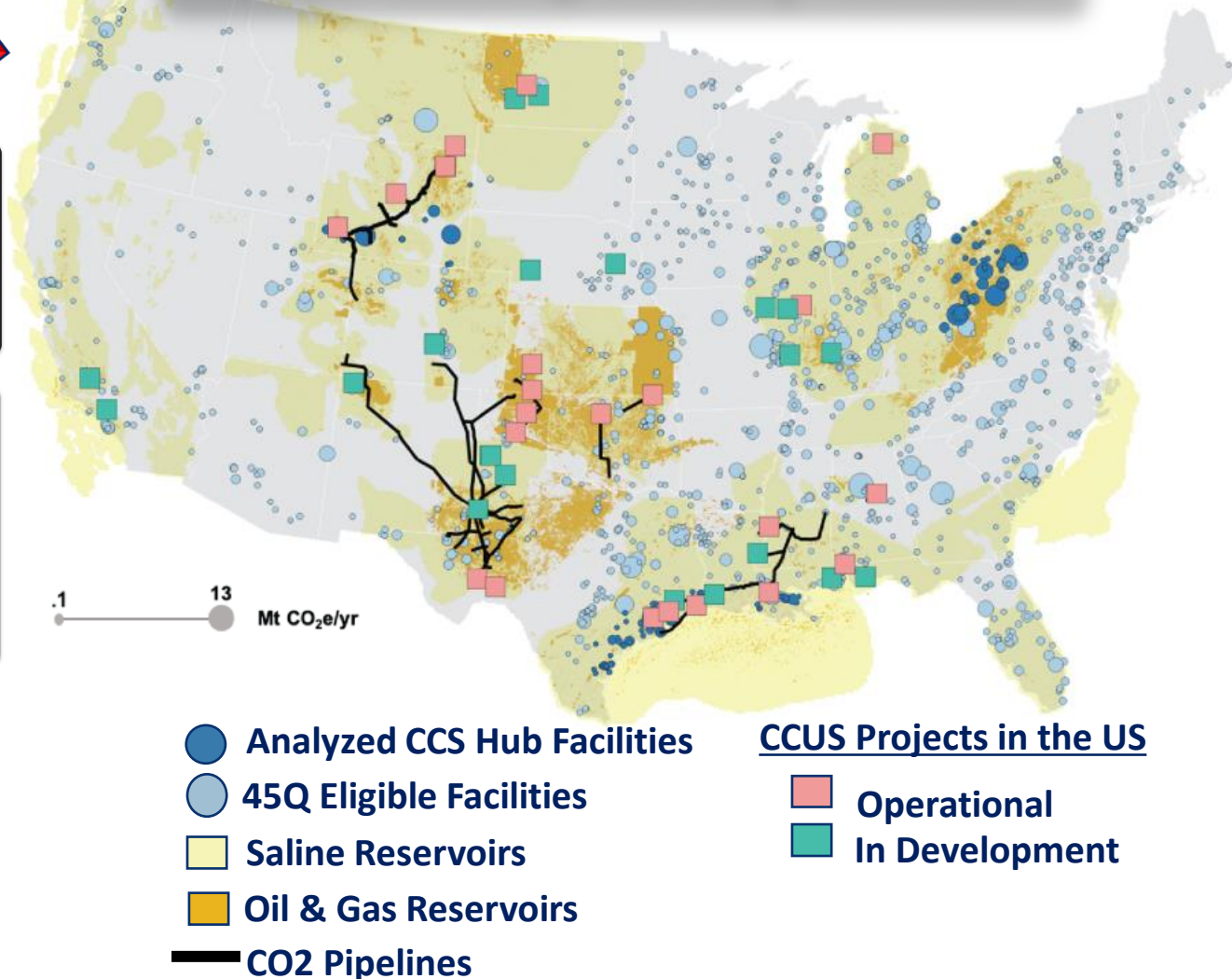


Creating a new focus on building the enabling CO₂ infrastructure

Overview of CO₂ Infrastructure



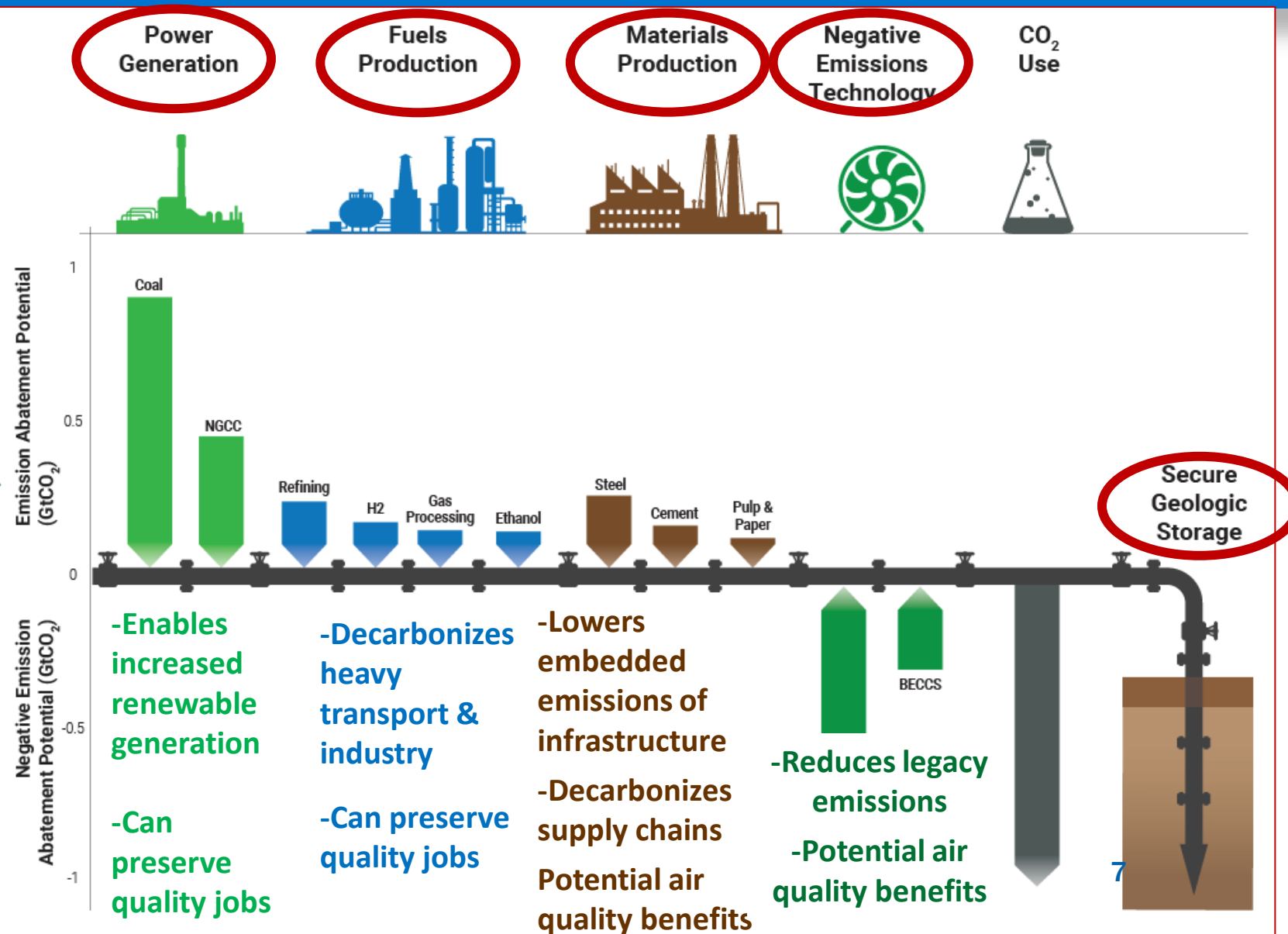
Major Existing U.S. CO₂ Facilities





Unlocking a gigaton of emissions reductions and removal economywide

- ✓ Support near-term, economywide emissions reduction and removal of CO₂ from the atmosphere.
- ✓ Preserve jobs in hard-to-decarbonize sectors that underpin the nation's clean industrial development.
- ✓ Create new industries and additional good-paying jobs for U.S. workers, often relying on the skillsets common to existing emissions-intensive industries.
- ✓ Decarbonize supply chains for manufacturing, fuels and power generation.





Challenges for Gigaton-Scale CO₂ Infrastructure

Inadequate Federal Policy Guidance

Unclear Role in Achieving Climate Targets

Limited Existing Policy Designs

New Policy Needed to Reach Gigaton-Scale

Challenging Permitting Environment

Numerous Federal, State, and Local Jurisdictions Involved

Uncertain Permitting Timelines

Variability in CO₂ Transport and Storage Regulation Among States

Insufficient Revenues and Uncertain Costs

Limitations of the Section 45Q Tax Credit

Challenge Aligning Players, Permitting, and Financing

Lack of a Long-term Liability Framework

Lack of Public Awareness and Varying Support

Low Public Awareness and Varied Opinions of CO₂ Infrastructure

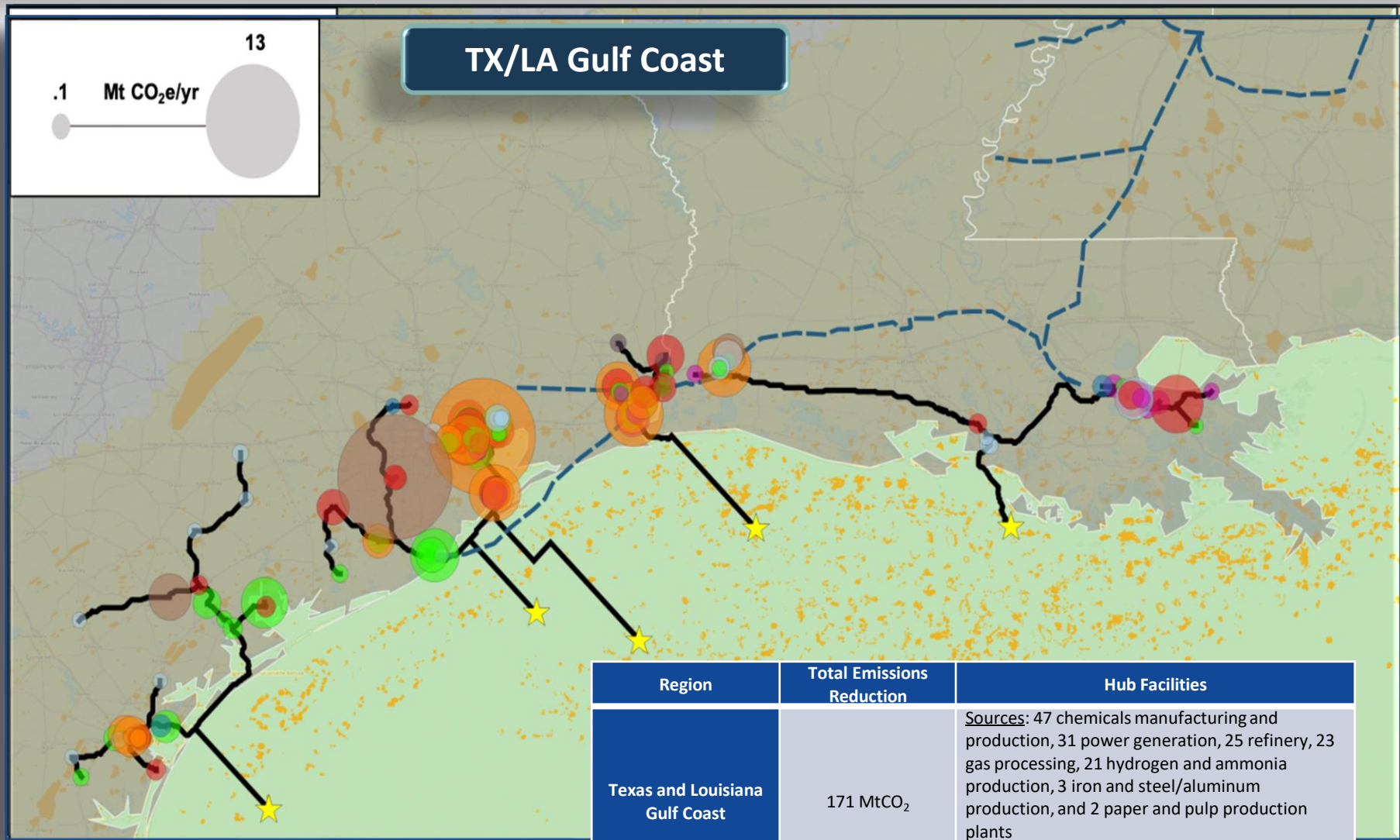
Historic Inequities in Infrastructure Siting

Concern of Continued Fossil Fuel Use



Potential CCS Hub Case Studies

- Coal generation
- Chemicals manufacturing
- Refineries
- Minerals production
- Gas generation
- Metals manufacturing
- Hydrogen or ammonia prod.
- Gas processing
- Pulp and paper
- ★ Sink
- Saline reservoirs
- Oil & gas reservoirs
- Offshore oil and gas reservoirs
- Corridor of WPCI
- Existing CO2 pipeline
- Notional CO2 pipeline route for clusters of facilities



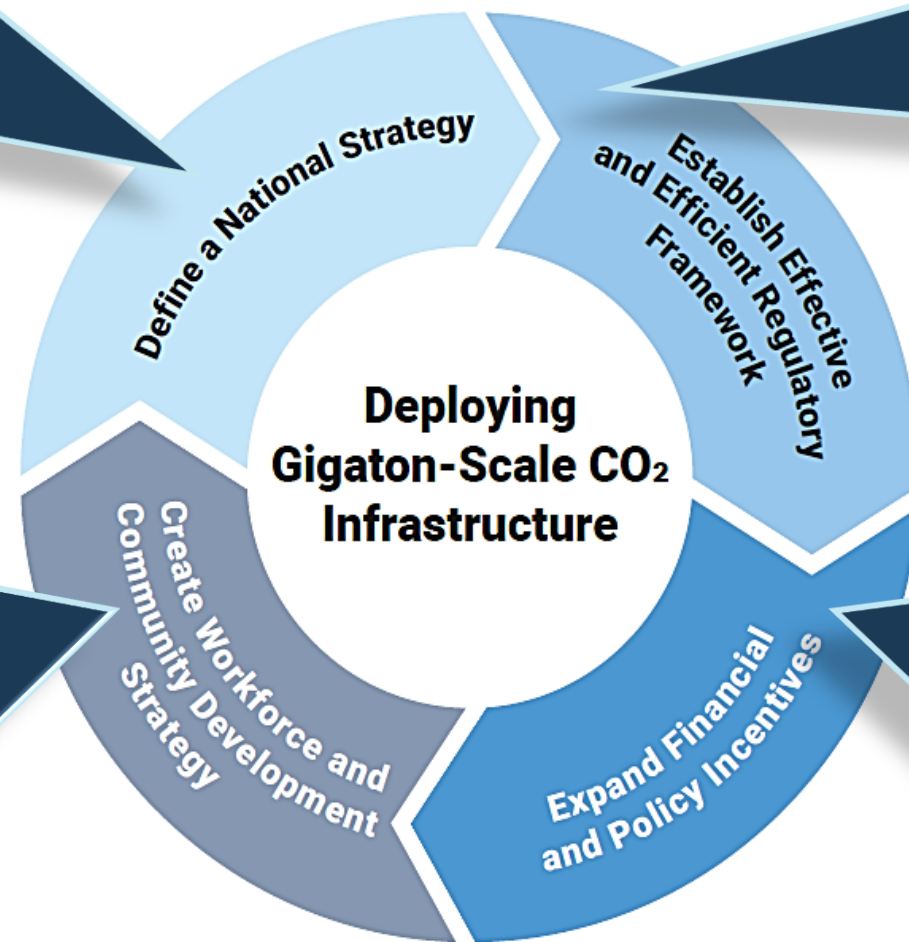
Region	Total Emissions Reduction	Hub Facilities
Texas and Louisiana Gulf Coast	171 MtCO ₂	<p><u>Sources</u>: 47 chemicals manufacturing and production, 31 power generation, 25 refinery, 23 gas processing, 21 hydrogen and ammonia production, 3 iron and steel/aluminum production, and 2 paper and pulp production plants</p> <p><u>Sinks</u>: 5 geologic storage sites, 1,462 miles of CO₂ pipelines</p>



Policy Blueprint for Gigaton-Scale CO₂ Infrastructure Development

- Achieve gigaton scale CO₂ infrastructure by 2050
- Establish national target for carbon dioxide removal for 2030 and 2050
- Prioritize regional CO₂ hubs serving multiple users
- Enable scalable CO₂ storage business models

- Create opportunities to transition conventional fossil energy jobs to CO₂ management jobs
- Extend economic development funding to communities building CO₂ hubs
- Conduct public education and outreach to address environmental justice concerns of frontline communities



- Enhance federal capabilities to coordinate regulation and permitting of CO₂ infrastructure projects
- Strengthen implementation of UIC Class VI permitting process
- Establish an effective regulatory framework for siting interstate CO₂ pipelines

- Extend & expand provisions for tax credits for CO₂ capture & storage
- Expand federal funding for CO₂ storage & pipeline infrastructures
- Expand RFS eligibility of CCS projects
- Establish a federal scheme for managing long-term liability risks of stored CO₂



Define a National Strategy



- Set a national target for implementing one Gt per year of CO₂ infrastructure capacity
- Direct agencies to promote clean U.S. supply chains
- With Congress, support scalable business models for CO₂ storage
- Set a national CDR target (separate and distinct from NDC)



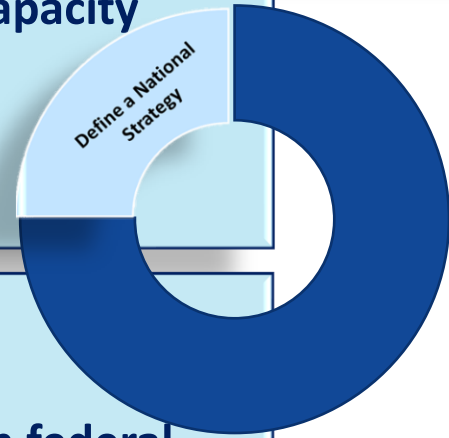
- Target funding for CO₂ infrastructure to offer equitable transitions for workers and communities
- Require federal agencies to designate CO₂ transport infrastructure corridors on federal lands
- Encourage deploying high-capacity CO₂ infrastructure for hub formation



- Coordinate the planning and development of hydrogen and CO₂ infrastructures



- With BLM, offer long-term leases for geologic storage of CO₂ on federal lands (BLM)
- With BOEM, provide a comprehensive regulatory framework for sub-seabed CO₂ storage in the Outer Continental Shelf





Establish an Effective and Efficient Regulatory Framework



- Create a Clean Energy Permitting Facilitation Office (CEPFO) to assist with timely and efficient CO₂ infrastructure permitting
- Convene an Interagency Working Group to develop an action plan for CO₂ hubs
- Explore and support the use of existing rights-of-way
- Explore and support the use of existing infrastructure for CO₂ pipelines



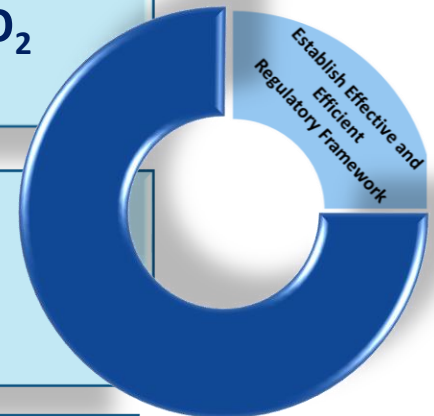
- Implement a government-wide assessment and solicit improvements for CO₂ infrastructure regulations (CEQ)



- Increase the funding to EPA for permitting Class VI storage wells



- Engage technical experts to inform it Class VI injection permitting review process
- Seek Congressional appropriations to increase the funding for permitting Class VI storage wells





Create Workforce and Community Development Strategy



- Expand apprenticeship and pre-apprenticeship programs that train skills relevant to CO₂ transport and storage



- With USDA and DOT, engage communities with displaced energy workers
- Direct project developers to allocate a portion of funds for community engagement
- Expand and standardize local outreach programs



- Fund the Dislocated Worker Grant program and prioritize grants that translate skills
- Require projects receiving tax credits to pay prevailing wages consistent with Davis-Bacon



- Direct project developers to allocate a portion of funds for community engagement
- Expand and standardize local outreach programs
- Increase funding requests for existing EJ programs
- Improve EJScreen



- Extend abandoned mine reclamation funding to support economic development communities that are developing CO₂ transport and storage hubs



- Provide Economic Development Administration Assistance to Coal Communities program to fund infrastructure projects, brownfields re-development, and technical assistance financing for non-infrastructure projects with an “economic development” focus

