I-WEST

Phase One Final Report | Detailed Chapter

Policy

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RESOURCES FOR THE FUTURE

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About this report

The Intermountain West Energy Sustainability & Transitions (I-WEST) initiative is funded by the U.S. Department of Energy to develop a regional technology roadmap to transition six U.S. states to a carbon-neutral energy economy. I-WEST encompasses Arizona, Colorado, Montana, New Mexico, Utah, and Wyoming. Each state is represented in this initiative by a local college, university, or national laboratory. Additional partners from beyond the region were selected for their expertise in applicable fields. In the first phase of I-WEST, the team built the foundation for a regional roadmap that models various energy transition scenarios, including the intersections between technologies, climate, energy policy, economics, and energy, environmental, and social justice. This chapter presents work led by an I-WEST partner on one or more of these focus areas. A summary of the entire I-WEST phase one effort is published online at www.iwest.org.

Authors

Alan Krupnick, Resources for the Future
Daniel Raimi, Resources for the Future
Wesley Look, Resources for the Future
Jhih-Shyang Shih, Resources for the Future
Seth Villanueva, Resources for the Future
Erin Campell, Resources for the Future

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Introduction

Before beginning to define the role for policy in decarbonizing the Intermountain West, there must be clarity about the existing policy landscape and, therefore, more broadly, the policy readiness of the region to move forward. Providing that baseline information is the primary goal of this chapter. In addition, given this baseline, we present future policy options gleaned from the I-WEST workshops, reports, interviews, and our own expertise.

Scope of the analysis

With many potential policies to discuss, analyze, and contrast, we need boundaries and a clear definition of what a policy is in the context of I-WEST.

Policy definition

We define policy as a legislative, regulatory, or other action by government that plays an important role in fostering or impeding decarbonization. Government policies often involve mandates and requirements on stakeholders (such as industrial carbon emitters) but need not. For instance, we consider a state's transition roadmap to be a policy. One could consider corporate decarbonization goals a "policy" as well, but for this report, we did not.

Policy jurisdictions

We describe the policy landscapes of the six states under assessment by I-WEST, as well as a limited review of tribal nation and federal policies.

The six Intermountain West states have bicameral legislative branches that mirror that of the federal government. The legislature works with the governor to pursue policy development and change. State policymaking is key to decarbonizing the region. Here, state governments have the opportunity to fine-tune policies to ensure that the specific challenges faced by each state or community are addressed.

There are some 60 tribes in the region, each with their own governance structures, histories of energy development, and priorities for future economic development—including energy development—and environmental protection. Tribes differ in numerous ways from states. Although their sovereign status allows them greater degrees of flexibility in some respects, the interaction between tribal policies and state or federal policies can be complex, and in some cases can impede energy development.

Federal policies are also important because in some areas, such as research, development, and deployment (RDD) spending, they dominate the policy landscape. Federal spending also represents a

huge share of government spending in the U.S., compared to even all 50 state budgets. Thus, a federal policy can have a greater impact on decarbonization than the six states and the tribes contained in the region. Finally, federal policy, by its nature, can solve issues of interstate coordination, while states must negotiate amongst themselves.

Out of practical necessity, we give local policies little attention. There are simply too many localities and too many interests to capture local policies in a comprehensive manner. Nevertheless, where a compelling policy issue crosses all localities, we will include local considerations. In any follow-up work where location for development becomes more specific, local issues should be considered carefully.

Finally, we acknowledge that other states, particularly those in the West, impact the Intermountain West region. When we judge that another state's policy is of sufficient importance for regional decarbonization, by setting an example or through direct impacts, we mention these states as well.

Policy timeframe

While the policy landscape focuses on currently implemented policies, where compelling, we include policies that have been promised or are in process—such as undergoing a rulemaking process—but have not yet been implemented. We also include policies that are so consequential that even if they are not yet law, enacting them would have very large implications for decarbonization. For example, the Biden Administration's Build Back Better legislation contains many elements relevant to decarbonizing the Intermountain West and is thus too consequential to ignore.

This report was written before the announcement and passage of the Inflation Reduction Act (IRA). Passed during reconciliation and signed into law in August 2022, the IRA is widely considered to be historic climate and energy legislation for the U.S. and covers many of the provisions in Build Back Better. While the IRA institutes and supports many programs that will impact decarbonization in the Intermountain West, this report does not capture those programs in any detail, except insofar as they appeared in the earlier failed Build Back Better bill.

Since the IRA was passed through reconciliation, the focus was not on introducing or altering regulatory programs, but rather on sending money from the treasury to support 2050 climate goals. The release of $205 billion (CRS 2022) from the Treasury comes primarily in the form of clean energy tax credits and support for innovation through grants and national lab funding. These credits and grants could help close the funding gap for clean energy projects in the Intermountain West. Additionally, the IRA takes a particular focus on supporting rural and energy communities, which makes up a great deal of the region. Based on our assessment of the regional policy landscape, some of the most relevant opportunities are listed here: Clean Hydrogen Production Tax Credit (45V), Advanced Manufacturing Production Tax Credit (45X), Clean Energy Production Tax Credit (45Y), Extension of the Energy

Investment Tax Credit (Section 48), Clean Energy Investment Tax Credit (48E), Clean Fuel Tax Credit (45Z), Extension of Carbon Capture and Sequestration Tax Credit (45Q) , Advanced Industrial Facilities Deployment Program, Environmental and Climate Justice Block Grants, Increased financing for the U.S. Department of Energy (DOE) Loan Programs Office, and Greenhouse Gas Reduction Funds.

For a detailed summary of these key tax credits, competitive grants, and consumer rebates, we recommend readers consult the following:

- **Inflation Reduction Act (IRA) Summary: Energy and Climate Provisions**
- **Summary of the Energy Security and Climate Change Investments in the Inflation Reduction Act of 2022**
- **Inflation Reduction Act of 2022**

Policy scope

We consider important policies that can either hinder or help in decarbonization. We limit ourselves, however, to energy and environmental policies, and policies such as siting and permitting that have environmental components and implications. Other I-WEST partners consider labor, economic development, and environmental justice (EJ) policies. We do not consider water policies and air pollution policies outside of carbon dioxide (CO_2) and methane. We define more general fiscal and monetary policies as out of scope, despite their potential relevance.

Policy classification

Since our research teams, policymaker contacts, and other stakeholders are more likely to be experts in a sector's policy area, rather than having expertise across all the policy types in each state, we organize our categorization by policy topics. As seen in the table of contents, the top-level topics are Cross Cutting, Electricity, Industrial (which includes fossil fuels), Fuels and Transportation. Research and development (R&D) policies, tribal policies, and carbon capture, utilization, and storage (CCUS) are classified under Cross Cutting; clean hydrogen (H_2), biofuels, solar, wind, oil, and gas relevant policies are classified under Fuels. A state's transition roadmap covers many topic areas and is classified under Cross Cutting policies.

Approach

To develop the information on the policy landscape we consulted a variety of sources. We attended all state and topical workshops organized by I-WEST partners. This chapter is heavily informed by those workshops. We also conducted interviews with key stakeholders in the states under assessment by I-WEST. These interviewees were identified through the workshops and through interactions with I-

WEST partner leads. The Resources for the Future (RFF) research team also gathered written information from a variety of sources, such as government documents, industry and government websites, academic articles, and many other sources. Finally, we consulted RFF materials, especially regarding the federal policy landscape.

Cross-cutting policies

U.S. Climate Alliance membership

To organize decarbonization efforts, several Intermountain West states have developed statewide transition roadmaps and adopted emissions targets. Following the U.S. withdrawal from the 2015 Paris Agreement, governors from Colorado, New Mexico, and Montana joined the U.S. Climate Alliance. The purpose of the alliance is to maintain the objectives of the original Paris Agreement and achieve its greenhouse gas reduction goals through the actions of member states.[1] To organize decarbonization efforts, several Intermountain West states have developed statewide transition roadmaps and adopted emissions targets.

Climate action planning

Colorado is the only Intermountain West state to have passed legislation committing the state to its GHG reductions targets.[2] The governors of New Mexico and Montana set their states' targets through executive action.

Towards achieving their goals, Colorado and Montana each developed state climate action plans, which outline policy goals and recommendations for achieving emissions targets. Colorado's plan suggests a transition away from coal and to renewable electricity while also reducing methane emissions from oil and gas development. Colorado worked with large utilities in the state to develop utility-specific clean energy plans to reduce emissions, retire coal plants, and increase renewables deployment. The plan also makes recommendations to encourage transportation electrification and increased building energy efficiency. The Montana climate plan makes similar recommendations to Colorado's, with particular attention paid to increased energy efficiency and deployment of renewables. Their plan also suggests support for native nations and advocates for additional federal policy.

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[1] See http://www.usclimatealliance.org/

[2] See *Climate Action Plan to Reduce Pollution* (2019).

Table 1. Climate Action Plans and GHG Reduction Targets by State		
State	**GHG Reduction Target**	**Climate Action Plan**
Arizona	None	n/a
Colorado	26% below 2005 levels by 2025, 50% by 2030, 90% by 2050	Greenhouse Gas Pollution Reduction Roadmap, Jan. 2021[3]
Montana	Net-zero GHG emissions for average annual electric loads by 2035	Montana Climate Solutions Plan, Aug. 2020[4]
New Mexico	45% below 2005 levels by 2030	None
Utah	None	n/a
Wyoming	None	n/a

The Colorado Energy Office also commissioned Energy & Environmental Economics (E3) to produce the report, *Opportunities for Low-Carbon Hydrogen in Colorado: A Roadmap,* which serves as an assessment of hydrogen energy development potential, barriers, and policy recommendations available to the state.[5] Beyond the work of state offices, independent research groups such as E3 are conducting roadmap-related work relevant to transition efforts.[6]

Carbon pricing policies

With the exception of the federal methane fee included in the Inflation Reduction Act of 2022, there are no carbon pricing policies at either the federal level or implemented within any of the Intermountain West states. That said, the California Cap-and-Trade Program allows offsets to be utilized from anywhere in the United States, including forest carbon sequestration projects and mine methane capture projects located in the region.[7]

[3] See *Colorado Greenhouse Gas Pollution Reduction Roadmap* (2021).

[4] See *Montana Climate Solutions Plan* (2020) .

[5] See Lintmeijer et al. (2021).

[6] See Mahone et al. (2020).

[7] See https://ww2.arb.ca.gov/our-work/programs/compliance-offset-program/offset-project-operators

Policies supporting carbon capture, utilization and storage

The recent legislation – Infrastructure, Investment and Jobs Act (IIJA) -- expands the Carbon Capture Technology program to include pipeline infrastructure with an additional $100 million over the next five years. This investment is to be administered by the National Energy Technology Laboratory (NETL), which awards funding to selected research, development, and demonstration (RDD) projects. These funds are not for RDD itself but would facilitate market growth.

Tax incentives for CCUS

The federal government offers several incentives for the deployment of CCUS equipment beginning construction before 2026, including for use in enhanced oil recovery (EOR). The most prominent of these is known as "45Q," which was recently expanded and raised in value after the signing of the IRA. For equipment entering service before February 9, 2018, the credit is worth $23.82 (in 2020 dollars) per metric ton (mt) of stored CO_2 and $11.91/mt for CO_2 used for EOR purposes. For equipment entering service later, the credit increases by 2026 to $50/mt and $35/mt for non-EOR and EOR uses, respectively. Other qualified uses of CO_2 are also eligible for the EOR rate (Jones and Sherlock 2021). The IRA increased these tax incentives to up to $85/ton CO_2 captured and stored.

The DOE Loan Program Office offers loan guarantees to deploy eligible CCUS projects, along with other projects that utilize fossil fuels but significantly reduce emissions of greenhouse gases or other pollutants (DOE Loan Program Office 2021a). The IRA recently allocated $11.7 billion to support activities by the Loan Programs Office. In addition, the U.S. Department of Agriculture's Rural Utilities Service could potentially be a future source of funding or low-cost lending for IOUs, co-ops, and Native nations seeking to deploy CCUS projects, although we could not find examples of tribes participating in this program.[8]

At the state level, relatively few financial incentives currently exist to speed deployment of CCUS, with the exception of incentives for EOR deployment, which we discuss in the following section.

[8] See https://www.hoeven.senate.gov/news/news-releases/hoeven-carbon-capture-is-coal-creeks-next-chapter

Table 2. State tax incentives for CCUS deployment (excluding EOR)	
State	**Description**
Arizona	None identified.
Colorado	None identified.
Montana	For state and local property tax purposes, CO_2 pipelines are assessed at a lower rate than other pipelines; CO_2 storage equipment is assessed at the same reduced rate as "conventional" pollution control equipment.
New Mexico	Provides a tax incentive for gasification and CCS equipment at integrated gasification (e.g., coal gasification) combined cycle power plants. The value of the credit may increase if the employer adds new workers.
Utah	None identified.
Wyoming	None identified.

Sources: Montana Department of Revenue (2021), New Mexico Statutes Annotated § 7-9J.

For some states, CCUS equipment may become eligible for certain tax incentives if new laws or regulations come into effect at the state or federal level in the months and years ahead. For example, Arizona offers an income tax credit for pollution control equipment, but only for equipment that is used to comply with federal or state regulations specific to that pollutant (see Arizona revised statutes §43-1081). It is possible that CO_2 would be considered a "pollutant" for these purposes, making CCUS property eligible for the tax credit.

Tax incentives for EOR

The federal government provides two tax incentives to encourage the deployment of enhanced oil recovery (EOR), which is a form of tertiary oil recovery. The most significant of these policies is the 45Q tax credit described above. The second is a tax credit (26 USC §43) eligible to operators using EOR when the price of crude oil falls below a certain threshold, which in 2020 was roughly $50 per barrel (Sherlock, 2021).

Many state governments also offer tax incentives for EOR and other tertiary recovery technologies. Table 3 summarizes those policies.

Table 3. State tax incentives for EOR	
State	**Description**
Arizona	None identified
Colorado	None identified
Montana	Montana's severance tax structure is complex, but in general, Incremental oil and natural gas produced using EOR is taxed at a lower rate than primary and secondary production.
New Mexico	Incremental oil production using EOR is taxed at a lower rate when benchmark national crude oil prices fall below a certain threshold ($28/barrel).
Utah	Incremental oil production from enhanced recovery is taxed at half of the standard severance tax rate.
Wyoming	Sales of CO_2 used for EOR are exempt from state sales tax. Severance taxes paid on CO_2 production that is subsequently used for EOR are credited against severance taxes on oil produced using that CO_2.

Sources: Montana §15-36-304; New Mexico §7-29A; Utah §59-5-102(9); Wyoming §39-16-105(a)(viii)(A), §39-16-105(a)(viii)(F), §39-14-205(d).

Class VI primacy

Montana and Wyoming are the only states in the I-WEST assessment to have applied to the U.S. EPA for class VI well primacy, with Wyoming receiving it in 2020. Having Class VI well primacy means that the Wyoming state government, rather than the U.S. EPA, has the authority to regulate and enforce activities associated with wells used for CO_2 storage.

Pore space

Pore space, which is the part of soil where air or water can flow through, is a geological feature of land that is relevant for carbon storage. Ownership of the pore space is therefore an important consideration for the region.

Generally, U.S. property rights hold that the person who owns the surface land has ownership of the space below, although the owner could choose to sell those rights to another entity. This being said, state legislatures, particularly those with CCS development, are starting to establish more explicit ownership criteria for the pore space. In Montana and Wyoming, the pore space is defined as private

property, and is owned by the surface owner. In Wyoming, the surface owner can split the surface estate from the pore space, although they are bundled together by default[9].

Unitization

Unitization refers to state-level rules that assemble multiple tracts of the subsurface into a drillable area to maximize recovery of oil and gas resources. In Montana's unitization statute, unitization can proceed upon a hearing which must be petitioned by 60% of the affected leaseholders with "just and reasonable" terms[10]. In Montana, 70% of the parties paying costs to unitization must approve for unitization to proceed. In Wyoming, those who own at least 80% of the pore space must sign a unitization plan for it to become effective[11].

State liability transfer

Liability transfer refers to which party will be responsible for CO_2 leakage from storage sites for the indefinite future. Montana's 2009 law[12] potentially provides a completion certificate 25 years after CO_2 injection ends, at which point, the storage operator's liability is reduced. However, even after obtaining a certificate of completion, storage operators in Montana are required to provide bonding or some other surety for an additional 25 years as an off-ramp to liability. Wyoming's recent law[13] addressing CCS liability allows storage operators to apply for a certificate of completion 20 years after CO_2 injection has ceased. If granted, this certificate transfers liability for leakage back to the state.

Policies supporting direct air capture

Direct Air Capture (DAC) of CO_2 currently faces high up-front costs, but offers immense potential for long-term benefits, making policies that encourage its deployment important. Currently, most policy levers for DAC are at the federal level, including the 45Q tax credit which was expanded to include DAC projects in 2018 and raised much more in the IRA. Although the original tax credit was designed for point-source carbon capture, which is a more mature technology than DAC, which captures CO_2 from ambient air, the new higher tax credit is expected to stimulate DAC projects.

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[9] Pore Space Ownership and Use in the Carbon Capture Industry | Newburn Law, P.C., https://s3-us-west-2.amazonaws.com/dgslaw/uploads/Wyoming-Statute-Pore-Space.pdf?mtime=20210720141256&focal=none https://leg.mt.gov/bills/mca/title_0820/chapter_0110/part_0010/section_0800/0820-0110-0010-0800.html

[10] Montana Code Ann. § 82-11-201

[11] WY Stat § 35-11-316 (2018)

[12] 82-11-183. Certificate of completion -- department of environmental quality participation -- transfer of liability, MCA (mt.gov)

[13] Bill Detail (wyoleg.gov)

In addition to expansions of the 45Q credit, some researchers have argued that deployment mandates or incentives could be an effective path forward for DAC deployment (A policy roadmap for negative emissions using direct air capture (nature.com)). One example of a deployment incentive that supports DAC is the CA Low Carbon Fuel Standard (LCFS), which has included credits for DAC since 2018. If the Intermountain West states move forward with a LCFS, including DAC in the credit system could bolster deployment.

Research, development, and demonstration funding

R&D expenditures

According to the 2021 *Survey of State Government Research and Development* conducted by the National Science Foundation (NSF), the Intermountain West states have drastically different research and development expenditures in the areas of energy, environment, and natural resources.[14] The survey measures the amount of R&D activity that was performed and funded by state governments. Colorado funds the largest amount of R&D in energy at $3.4 million, plus $11.6 million in environment and natural resources R&D throughout FY2020. Montana and Utah also spend a relatively high amount on environment and natural resources R&D, with $7.8 million and $5.6 million, respectively, in FY2020. Wyoming is the only other state in the region other than Colorado to put more than $1 million into energy funding, with $1.7 million allocated in FY2020.

Table 4. State R&D expenditures in FY2020

(Thousand $)	Arizona	Colorado	Montana	New Mexico	Utah	Wyoming
Energy	$0	$3,400	$0	$200	$500	$1,700
Environment and natural resources	$1,800	$11,600	$7,800	$2,100	$5,600	$2,000

Source: National Center for Science and Engineering Statistics, 2021, Survey of State Government Research and Development, FY 2020.

Infrastructure Investment and Jobs Act

In 2021, the Infrastructure Investment and Jobs Act (IIJA) was signed into law sending $1.2 trillion of public investment to upgrade roads, bridges, electric grids, and much more between 2022 and

[14] https://www.nsf.gov/statistics/srvystaterd/#tabs-1

2026. Of most relevance here, the package reserves $31 billion for RDD in clean energy technologies, mostly to be administered as competitive grants by DOE. The funds cover RDD in green hydrogen and carbon capture, advanced batteries, advanced nuclear, and DAC technologies. The IIJA also creates the DOE Office of Clean Energy Demonstrations (OCED) to be in charge of the management of demonstration projects. OCED will conduct project management and oversight of all the demonstration projects noted above and more, representing $22 billion of investment in demonstration projects. This federal landmark bill creates a wealth of clean energy development opportunities for the Intermountain West region. The IRA put much more money into decarbonization innovation. Interested readers should consult sources cited in the introduction for details.

Carbon capture, utilization, and storage

A key piece of the IIJA focuses on CCUS technologies. First, the IIJA expands several DOE programs with $300 million targeted to the Carbon Utilization program to include the development of standards and certifications to support commercialization of carbon oxide products. Along with the standardization of carbon oxide products, this program also awards grants to local authorities to use or procure products derived from carbon capture oxides. By focusing on the commercialization of carbon capture outputs, this piece of the legislation can be understood as a demand-pull instrument (i.e., helping to create market demand).

The IIJA allocates $2.5 billion to create a commercialization program for the development of large-scale carbon sequestration projects and associated transport infrastructure. The funding covers the feasibility, site characterization, permitting, and construction stages of project development and is to be overseen by the DOE's Fossil Energy and Carbon Management program. The Secretary then selects applications at any stage of a project's development on a competitive basis (but the DOE has not yet specified the form of the funding).

Finally, the IIJA grants $3.5 billion for carbon capture demonstration and pilot programs administered through OCED. Along with funding for CCUS, the IIJA also provides $2.1 billion for the Carbon Dioxide Transportation Infrastructure Finance and Innovation Program in the forms of secured loans, in consultation with the DOE Loan Programs Office, and grants.

Direct air capture

The IIJA establishes the Carbon Removal program and provides it with $3.5 billion for the period of 2022- 2026. This program is to be administered through grants, cooperative agreements or contracts for projects that contribute to the development of four regional DAC hubs. Projects will be selected based on geographic diversity, scalability, jobs, cost, and other considerations to advance carbon dioxide removal.

The legislation also appropriates new funding for DAC Technology Prize Competitions. DOE is allocated $100 million for commercial technologies and $15 million for pre-commercial technologies for the year 2022. The goal of these competitions is to promote innovative and diverse approaches to DAC.

Green hydrogen

Funding for green hydrogen (a method for producing decarbonized hydrogen by splitting water using renewable or nuclear power) constitutes another key part of the IIJA with $9.5 billion for different programs in the sector. The bill expands the scope of the DOE's hydrogen R&D program, focusing on the demonstration and commercialization of clean hydrogen production, processing, delivery, and end-use application technologies. Additionally, the bill establishes four new RDD programs including: (1) four or more regional clean hydrogen hubs (this element receives the bulk of the funding at $8 billion), (2) development of a national strategy and roadmap to facilitate a clean hydrogen economy, (3) a clean hydrogen manufacturing and recycling program, and (4) a demonstration, commercialization, and deployment program to decrease the cost of clean hydrogen production from electrolyzers. Eligible entities will receive grants on a competitive basis from the DOE. The IRA includes a major tax credit program for "clean" hydrogen production.

Energy storage

A total of $10 million is allocated to demonstration projects for energy storage of intermittent renewable electricity. Two other energy storage programs, namely the (1) Energy Storage Demonstration Projects and Pilot Grant Program and (2) Long-Duration Demonstration Initiative and Joint Program, are receiving $355 million and $150 million of funding respectively. The IRA also addresses energy storage.

Advanced nuclear

The Advanced Reactor Demonstration Program, which facilitates industrial demonstration partnerships of advanced nuclear reactors, receives $3 billion for the period 2022-2026.

Batteries

One section of the ill focuses on battery manufacturing. It establishes the Battery Material Processing Grant and the Battery Manufacturing and Recycling Grant Programs to be overseen by the DOE's Office of Fossil Energy. Both grant programs are each allocated $3 billion over the next five years. Other RDD grant programs also receive $125 million to develop the battery recycling value chain. In addition, the IIJA supports the DOE's ongoing Lithium-ion Battery Recycling Prize with an additional $10 million to carry out a third phase of the program. These programs are open to both private and public entities.

Both battery grant programs are expected to prioritize entities that represent consortia or industry partnerships. The development of these new energy technologies is highly relevant to the transition towards a cleaner and more flexible energy grid, which will directly impact the carbon emissions embodied in cement and steel manufactured in the U.S. and in other hard to abate sectors.

Pumped storage

The Long Duration Energy Storage for Everyone, Everywhere Initiative is being administered by OCED to support energy storage demonstration, validation, and piloting with $505 million in competitive grants funded in the IIJA. [15]

Demonstrations and pilot projects

The IIJA allocated $21 billion to OCED for energy transition demonstration and pilot programs. This includes, as partly noted above, $10 billion for carbon capture and DAC, $8 billion for clean hydrogen, $3.5 million in grants for large carbon capture pilots and demonstrations, $1 billion for rural and remote energy demonstrations, and $500 million for the transition of mining lands to clean energy.[16]

Grid

The IIJA provides $5 billion from FY22-26 towards the demonstration of transmission, storage, and distribution infrastructure innovations that improve regional grid resilience.

Bioenergy

The DOE's Bioenergy Technologies Office (BETO) began the AlgaePrize competition in January 2022 to spur research into lower cost algal biofuels production.[17]

Loan guarantees

The DOE Loan Programs Office currently administers two relevant loan guarantee programs to RDD in the Intermountain West region: the Title 17 Innovative Clean Energy Loan Guarantee Program and the Tribal Energy Loan Guarantee Program, both of which were authorized by the 2005 Energy Policy Act.

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[15] https://www.energy.gov/articles/biden-administration-launches-bipartisan-infrastructure-laws-505-million-initiative-boost

[16] https://www.energy.gov/sites/default/files/2021-12/FECM%20Infrastructure%20Factsheet.pdf

[17] https://www.energy.gov/eere/bioenergy/algaeprize-competition

The Title 17 Loan Guarantee Program intends to bridge the funding gap between pilot projects and wide-scale commercialization by investing in early-stage deployment, a stage where energy projects tend to lose the support of investors. The initial commercial deployment of energy technology can be limited by the uncertainty between pilots/demonstrations, and large-scale commercialization, which often impacts a project developer's ability to secure long-term debt financing to build out the project. Figure 1 illustrates the struggles of this timeline and clarifies the role of the Title 17 program.

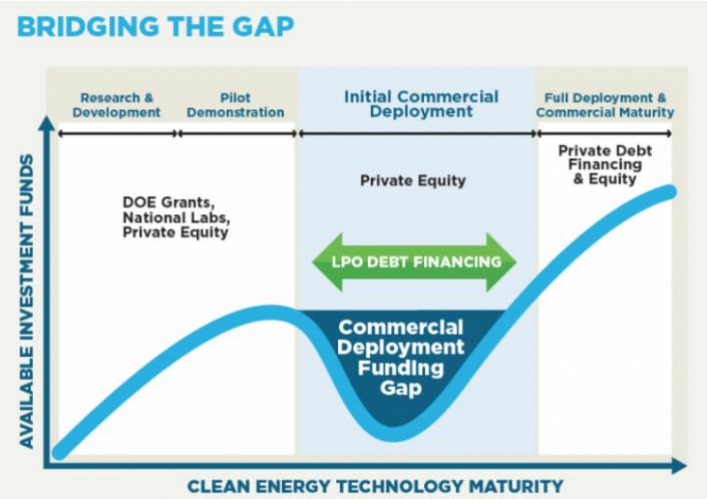

Figure 1: DOE Loan Programs Office Schematic

Image: Source, DOE. [TITLE XVII | Department of Energy]

Title 17 has provided more than $25 billion in loan guarantees to a broad portfolio of projects including four in the Intermountain West region (Agua Caliente Solar Project in Arizona, Alamosa Solar Project in Colorado, Mesquite 1 Solar Project in Arizona, and Solana Solar Project in Arizona). Title 17 is an opportunity for all-of-the-above clean energy deployment from solar to energy efficiency projects, to advanced fossil fuels. The evidence on the program's cost-effectiveness, however, is quite limited (http://www.sciencedirect.com/science/article/pii/S0140988319300751).

The Tribal Energy Loan Guarantee Program is a partial loan guarantee program that can secure up to $2 billion in loans to support economic opportunities for Native nations through energy development. In this program, DOE can guarantee up to 90% of the unpaid principal and interest on any loan made to a federally recognized tribal corporation for energy development. Different from the Title 17 program which focuses on clean energy development, the Tribal Energy Loan Guarantee Program can be used to support nearly any energy development including fossil production and mining. The goal of the program is to improve tribal access to capital, flexible custom financing, and project expertise. However, we are not aware of any loans that have been issued to date through this program.

Distinct issues

Because of their sovereign status, and because of their trustee relationship with the U.S. federal government, tribes have a distinct set of opportunities and challenges in the energy transition, with wide variation across tribes in the Intermountain West. Some tribes have a long history of energy

development that have, in many cases, been accompanied by federal mismanagement. Many other tribes in the region have little or no history of energy development.

This section discusses several issues of importance for Native nations in the region. However, it is not intended to be comprehensive, and significant research gaps remain in understanding how policies can support tribes in the energy transition.

Energy governance

Energy has played a substantial role in economic development for a substantial number of Native nations in the Intermountain West. Historically, this development has primarily consisted of mining for coal, uranium, oil, and natural gas; and in a small number of cases, electric power generation. Oil and gas development is the most common energy production activity across regional tribes, with at least 200 wells drilled since 1950 on eight reservations: Blackfeet, Crow, Fort Peck, Jicarilla-Apache, Navajo, Southern Ute, Uintah and Ouray Ute, and Wind River. Figure 2 illustrates the number of oil and gas wells drilled on each reservation from 1950 through 2020 (note that these data exclude off-reservation Trust lands).

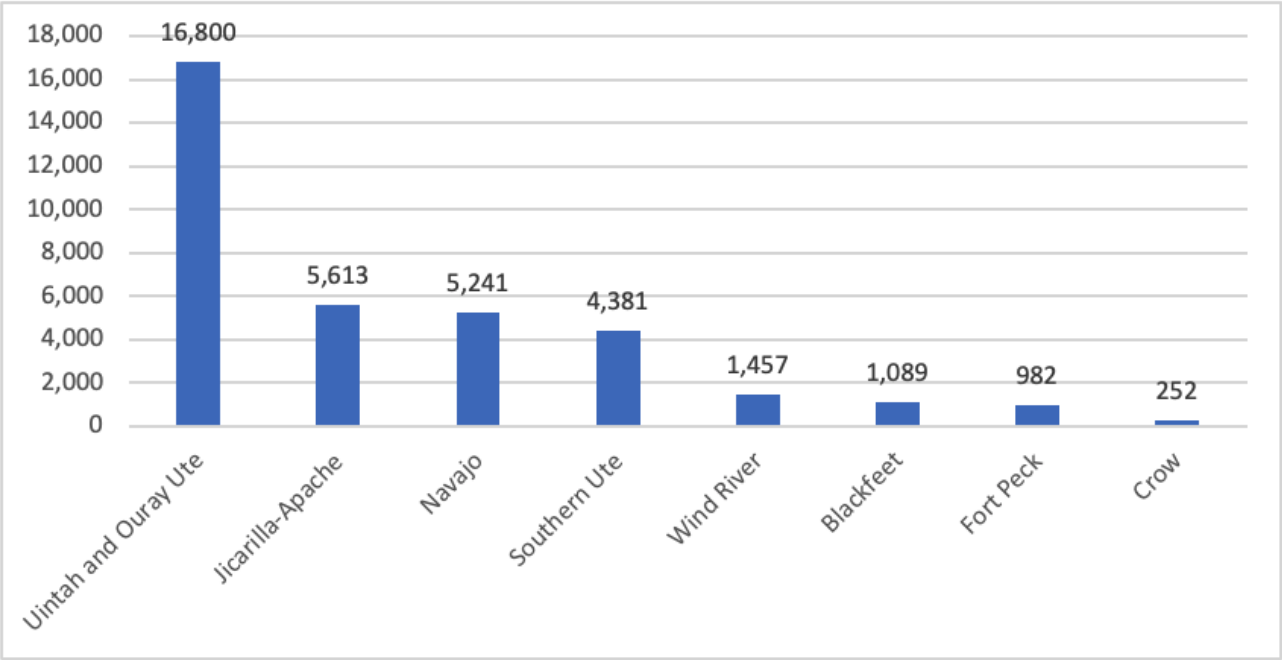

Figure 2: Oil and gas wells drilled on reservations in the Intermountain West between 1950 and 2020. Data source: Enverus.

Multiple factors have led to a complex and sometimes fraught relationship between the federal government and regional tribes regarding natural resource governance. For much of the 20th Century, federal regulators responsible for fulfilling trust obligations related to energy development on tribal lands failed to negotiate fair leases, properly enforce regulations, and ensure environmental protection (Smith and Frehner, 2010), with examples occurring as recently as the late 2010s (Office of Inspector General, U.S. Department of Interior, 2017).

Along with this history of neglect, the complexity of arranging intra- and inter-governmental coordination between Native nations and multiple federal agencies responsible for fulfilling trust obligations has created challenges. For example, policies related to natural resource development often require close coordination between tribal authorities and multiple federal agencies within the Department of Interior (DOI), including the Bureau of Indian Affairs (BIA), Bureau of Land Management (BLM), Office of Natural Resource Revenue (ONRR), Office of Surface Mining Reclamation and Enforcement (OSMRE), and others. One analysis from 2011, based on interviews with government regulators, found that "even a diligent, well-trained person trying to properly fulfill his or her federal responsibility might find the job confusing and overwhelming at times" (Grogan et al., 2011). This complex regulatory environment has been cited as a factor that impedes economic development more broadly across Native nations (e.g., Akee and Jorgensen, 2014).

In essence, any major energy activity (e.g., signing an oil and gas lease, siting electricity transmission lines) on tribal lands needs to be approved directly by the Secretary of the Department of Interior. Recognizing this challenge, Congress enacted the Indian Tribal Energy Development and Self-Determination Act of 2005, which established Tribal Energy Resource Agreements (TERAs). TERAs established a process through which tribes take administrative and regulatory control over energy projects and enter into leases and business agreements with operators. However, a 2015 GAO report found that tribes were unable to take advantage of TERAs due to "uncertainty regarding the regulations, a complex application process, and concerns regarding the costs to tribes of assuming federal functions," and no tribe completed a TERA until March 2022, when a related agreement between the DOI and the Red Lake Band of Chippewa Indians (northern Minnesota) established the first Tribal Energy Development Organization (BIA, 2022).

The DOI has made efforts to streamline the bureaucratic hurdles to energy development by, for example, establishing "one-stop shops" that house regional offices for multiple federal agencies. However, these efforts have not prevented slow processing times and mismanagement in some cases (Grogan et al., 2011; Office of Inspector General, US Department of Interior, 2017).

In addition to coordination challenges, tribal energy development may be impeded by inadequate consultation with tribes on specific energy projects. For example, Susskind et al. (2022) describe three cases in California where tribes opposed renewable energy development due, in part, to inadequate

consultation and engagement with BLM and state/local officials. In all three cases, projects did not go forward in part because of this opposition. Notably, the Biden Administration has laid out detailed guidance to agencies with the goal of improving coordination, consultation, and integration of treaty rights into federal policymaking (US Department of Interior, 2021), though the effects of such efforts remain to be seen.

Congress has taken other measures that have sought to better recognize the sovereignty of Native nations (Grogan et al., 2011), and recent Executive branch regulations on leasing and right-of-way issues have done the same (Mills, 2021). The U.S. Department of Energy operates numerous programs designed to support tribal energy development through capacity building and direct financial support for projects, which can help Native nations identify promising opportunities for future clean energy development, reduce the burdens of high energy costs, and increase access to modern energy services (Office of Indian Energy Policy and Programs, 2022).

However, despite efforts to support new energy development, tribes heavily dependent on fossil fuel extraction and related activities face key questions about whether, how, and to what extent to continue such activities. Some, such as the Southern Ute Indian Tribe, are partnering with private sector investors to deploy novel technologies that utilize the Tribes' natural gas resources for zero-carbon power generation (Southern Ute Growth Fund and 8 Rivers Capital, 2021). For other tribes, such as the Navajo, shuttering of coal mines and coal-fired power stations have created substantial economic challenges that will require attention from policymakers (AP, 2021).

Environmental justice and remediation

Energy development for some Native nations in the region has been accompanied by injustice resulting in long-term public health and pollution problems. These include, for example, increased mortality rates for Navajo uranium miners (Roscoe et al., 1995); groundwater pollution on the Navajo reservation associated with poorly regulated uranium mining (Hoover et al., 2017); and a large oilfield wastewater plume on the Fort Peck Reservation (Thamke and Smith, 2014).

Reservations also host legacy fossil energy infrastructure. For example, reservations in the region are home to more than 1,600 abandoned mines, although remediation at most of these sites has been completed as of late 2021 (OSMRE, 2021). Orphaned oil and gas wells can also be found on reservations, though data are quite limited. Numerous recent analyses have demonstrated that federal regulations do not adequately protect against the risk that oil and gas wells on federal and tribal lands could become "orphaned," posing environmental risk for host communities and financial risk for taxpayers (GAO, 2019; Raimi et al., 2021).

A recent analysis of data from oilfield data provider Enverus identified a considerable number of oil and gas wells on reservations in the region that could become orphaned in the years and decades ahead. Although reporting classifications vary across jurisdictions, the wells of most concern are those listed as "inactive," "shut-in," or "temporarily abandoned," as these wells may never again produce economic quantities of oil or natural gas. Wells listed as "active" were producing at the time data were gathered (December, 2021), but may also be subject to becoming orphaned wells depending on economic conditions and relevant federal and/or tribal regulations. "Plugged and abandoned" wells have been decommissioned, but also require monitoring and may need additional remediation depending on the long-term integrity of the plug.

Table 5. Oil and gas wells by status on reservations in Intermountain West states

	Active	Plugged and abandoned	Inactive	Shut-in	Temporarily abandoned
Blackfeet	350	1,154	251	354	36
Crow	38	203	66	12	2
Fort Peck	84	683	141	62	22
Jicarilla-Apache	2,576	1,744	3,787	5	45
Navajo	567	2,608	1,327	136	30
Southern Ute	3,458	252	51	30	46
Uintah-Ouray	8,991	874	1,757	317	1,101
Wind River	435	57	1	141	85

Data source: Enverus. Data gathered December, 2021. Excludes off-reservation trust lands.

Some Native nations have developed novel policy approaches to deal with the risks posed by some of this infrastructure. For example, the Jicarilla-Apache tribe has adopted a policy that requires operators to decommission wells unless they can prove, to the satisfaction of the Tribe's oil and gas regulator, that the well is economically viable, and prohibits wells from being temporarily abandoned for more than 30 days (Jicarilla Apache Nation Code Title 18, Chapter 10, §1(A)(1)).

Clean energy deployment

On reservation lands, federal (and state) tax incentives for renewable energy development have not always been accessible because tribes and tribal corporations are not subject to federal income taxes,

though tribal members and associated property may be subject to state and local taxes, such as states sales tax for transactions occurring on reservations (Zimmerman and Reames, 2021). A detailed examination of federal and state tax policy for tribes, tribal corporations, tribal members, and associated property is beyond the scope of this analysis. Nonetheless, tribally-owned corporations or other entities with limited or zero tax liability have not been able to take advantage of federal tax credits, or relevant state tax credits that we discuss below (assuming the tax credit was non-transferrable and non-refundable). This has been a significant issue, particularly with regard to federal energy policies, because the most substantial federal energy policies (by spending levels) are subsidies implemented through the tax code such as the PTC, ITC, 45Q carbon capture tax credit, 48C manufacturing tax credit, and others.

A significant change in this policy was included in the Inflation Reduction Act of 2022, which makes Native nations and other entities that do not pay federal income taxes eligible to receive energy-related tax credits through so-called "direct pay." Although it is difficult to estimate the precise effect of this policy change, it very clearly improves the economics of many energy projects that may be contemplated by Native nations in the region.

Permitting

Transmission lines

Transmission lines are mostly regulated by each state's public utility commission. Table 6 shows each state's relevant agency and permit required to site a transmission line.

Table 6. State permitting authorities

State	Office of interest	Permit needed
Arizona	Arizona Corporation Commission	Certificate of Environmental Compatibility
Colorado	Colorado Public Utilities Commission	Certificate
Montana	Montana Department of Environmental Quality	Certificate of Compliance
New Mexico	New Mexico Public Regulation Commission	Location Permit
Utah	Utah Public Service Commission	Land Use Permit
Wyoming	Wyoming Industrial Siting Council	Industrial Development Information and Siting Act Permit

Of these policies, the most unique is Arizona's Certificate of Environmental Compatibility (CEC). To obtain a CEC, a project must demonstrate that it will balance the broad public interest: the need for an adequate, economical, and reliable supply of electric power against the desire to minimize any negative effects on the environment and economy. CEC applications are evaluated by the Arizona Power Plant and Transmission Line Siting Committee by multi-day hearing.

Another unique feature among these policies is that, in Montana, the certification authority resides within the department of environmental quality rather than a corporation commission, perhaps indicating additional weight given to environmental considerations for transmission line siting.

Industrial permitting (New Source Review)

The Clean Air Act requires that new plants and major modifications of industrial (and power) plants enter the Clean Air Act's New Source Review process, which can be an onerous regulatory process (particularly if the plant is located in an area violating air quality standards). This requirement creates disincentives for plants to invest in modifications that reduce their CO_2 emissions like the construction of carbon capture facilities at power and industrial plants. Adding on those decarbonizing modifications would subject the entire plant to NSR review and possible updating of its emissions control technologies. The federal government needs to pay more attention to this challenging issue.

Permitting on federal land

Major new facilities on federal lands, developed with federal funding, or subject to federal permitting would be subject to environmental reviews under the National Environmental Policy Act (NEPA). Numerous reforms of NEPA have been implemented to increase its protections and streamline the approval process. In particular, the IIJA contains substantive provisions designed to streamline NEPA environmental reviews for "major projects," such as those funded by IIJA and those funded under the Fixing America's Surface Transportation (FAST) Act of 2015. The Council on Environmental Quality (CEQ), which writes NEPA guidance, called for expedited reviews to CO_2 reducing investments, such as CCUS. Outside of the NEPA process, CEQ also called for expediting CO_2 pipeline expansion.

Renewables

For wind energy facilities, the siting and permitting protocols are highly localized and varied across states. Most states in the region take a hybrid approach, requiring state level permits above a certain generation threshold in addition to relevant local permits. Table 7 details the state permits that might be required beyond any local approvals.

Table 7. Wind energy permitting by state		
State	**Authority level**	**Detail**
Arizona	Hybrid State/Local	Arizona siting procedure states that certain wind facilities must obtain siting and zoning approvals at the municipal or county level in addition to obtaining a state Certificate of Environmental Compatibility prior to construction if it generates more than 100 MW.
Colorado	Hybrid State/Local	Local authorities have 120 days to issue a final decision on siting applications for wind energy. Additionally, the public utilities commission must issue a certificate prior to construction.
Montana	Local	There is no state level siting authority for wind energy. Local governments control zoning and land use decisions.
New Mexico	Hybrid State/Local	Local governments regulate wind siting through zoning and land use regulations. Projects generating over 300 MW must be reviewed by the state Public Regulation Commission.
Utah	Local	There is no state level siting authority for wind energy. Local governments control zoning and land use decisions.
Wyoming	Hybrid State/Local	State law requires projects to secure local approval for any energy facility greater than 500kW. Large wind facilities (more than 19 turbines) must obtain a permit from the state industrial siting council.

Source: NCSL State Approaches to Wind Energy Siting, 2020

Table 8. Solar energy permitting by state		
State	**Authority level**	**Siting/permitting details**
Arizona	Local	Permits are distributed at the local level by counties and municipalities. Municipalities and counties are not allowed to require a stamp from a professional engineer unless deemed necessary.
Colorado	Hybrid State/Local	Permits are distributed at the local level by counties and municipalities. There is a statewide cap for permit fees for solar energy.
Montana	Hybrid State/Local	State and local governments are involved in permitting solar.
New Mexico	Local	Permits are distributed at the local level by counties and municipalities. In some cases, a structural analysis from a licensed engineer is required.
Utah	Local	Permits are distributed at the local level by counties and municipalities.
Wyoming	Hybrid State/Local	State and local governments are involved in permitting solar.

Source: DSIRE

Pipeline siting regulations and permitting

CO_2 pipelines

Oversight of CO_2 pipelines has been rejected by Federal Energy Regulatory Commission (FERC), and the U.S. Government Accountability Office has determined that oversight lies under the DOT's Surface Transportation Board (STB). Although STB is responsible for oversight, this power is often delegated to the states. Because of this, CO_2 pipelines are largely overseen by state authorities except for a few scenarios: the pipeline crosses state lines (interstate) or the pipeline crosses federal land. Further, siting CO_2 pipelines has no federal siting authority requirements, and federal agencies have no power of eminent domain for CO_2 pipelines unless on federal land. Thus, while pathways for federal siting authority through the NEPA, ESA, and other federal acts have been explored (Righetti 2017), authority still falls mainly to state commissions. Although many states have yet to explicitly address the process for siting, there are some policies in place. In New Mexico, for example, any person, firm, or corporation can exercise eminent domain to secure siting for the right of way of a pipeline on both public and private land. This is regulated through the NM Public Regulation Commission Pipeline Safety Bureau and stands out for addressing CO_2 pipelines explicitly.[18]

Hydrogen pipelines

In contrast with CO_2, hydrogen can be transported either in blends or exclusively through upgraded existing natural gas pipeline infrastructure. Although there are some technical and safety concerns with blending hydrogen into existing pipelines (and more for repurposing natural gas pipelines for exclusive hydrogen use, the potential for a right-of-way to be already established cuts the siting and permitting time.

Like CO_2 pipelines, there is no federal siting authority for intrastate pipelines to carry hydrogen, and developers must seek approval from the relevant state agencies.

Conversion of oil and gas pipelines to CO_2 or hydrogen pipelines

Converting an existing natural gas or oil pipeline to CO_2 gas service would likely face a number of economic, technical, and safety challenges. For example, CO_2 transport requires high pressure and very low temperatures to be economical, so existing pipelines would need to be retrofitted with "crack arrestors." It also requires many more pumping stations along the route compared with a new pipeline

[18] See Nordhaus and Pitlick, Energy Law Journal, 2009 for additional specifications

built for CO_2 service. Even if an existing pipeline was located, the large number of pumping stations required would not be operationally practical for conversion of a long-distance pipeline.

Currently, the FERC can decide if a natural gas pipeline may be withdrawn from use for shipping natural gas, but once FERC grants a withdrawal from service, its jurisdiction ends, because it has no jurisdiction over carbon pipelines. In contrast, no federal agency regulates whether an oil pipeline may be withdrawn from service.

The U.S. Pipeline and Hazardous Materials Safety Administration (PHMSA) regulates the safety of natural gas, oil and supercritical fluid CO_2 pipelines, but does not regulate the safety of a pipeline when CO_2 (carbon) is pumped through it as a gas, when pipeline pressure is low. Congress directed that PHMSA regulate CO_2 gas pipelines, but PHMSA has failed to issue safety standards for these pipelines. It is likely that state and local governments could not step into this gap to regulate CO_2 gas pipeline safety. Therefore, if a natural gas or oil pipeline is converted to ship CO_2 as a gas, it might not be subject to any federal or state pipeline safety standards. To our knowledge, no state policy, regulation, or safety standard exists on repurposing oil and gas pipelines to transport CO_2.

There are also issues in the conversion of natural gas pipelines to transport hydrogen. The nation's vast natural gas pipeline system could serve as a cost-effective means of shipping hydrogen among a network of regional hydrogen hubs under development. However, the quantities, location, and timing of blended or pure hydrogen that will be needed, have not been assessed and "the dynamics of increasing hydrogen production, transport, and storage as part of future decarbonization efforts are still unclear."[19]

The conversion of natural gas pipelines to carry hydrogen faces a couple of regulatory uncertainties. One example is FERC's regulation of gas quality for blended methane and hydrogen carried in natural gas transmission pipelines during a hydrogen transition. How, and to what extent, FERC could or should establish new hydrogen policies for interstate pipelines under its existing NGA authority, or whether additional legislative authority or direction would be required, may be questions for Congress. Similar concerns about gas quality standards exist among the states with respect to intrastate transmission pipelines and natural gas distribution systems (CRS, 2021). Another example is DOT PHMSA's regulation of hydrogen pipeline safety. The existing pipeline regulations are focused primarily on natural gas, so they may not be adequate to address the potential embrittlement and leakage risks associated with hydrogen transport. Whether PHMSA should develop more hydrogen-specific pipeline safety regulations, and what such regulations could entail, may be an issue for Congress (CRS, 2021).

[19] https://crsreports.congress.gov/product/pdf/R/R46700

Hub promotion

Most industrial and energy processes and the transport of energy and CO_2 benefit from scale economies – the bigger the cheaper. They also benefit from network externalities – the co-locating of complementary producing, supplying, using and transporting activities, and, in the case of CO_2, storage opportunities. Such co-location can stimulate innovation, attract top talent, and save distribution costs. Thus, to bring costs of the transition down and to encourage innovation, governments around the world are becoming interested in providing incentives for this agglomeration of economic activity. While places like Rotterdam have had a clean energy hub for many years, the U.S. is just getting into the game with the funding for hubs promised in the recent Infrastructure legislation. Specifically, at least four regional clean hydrogen hubs will be funded ($8 billion) with additional funding of four regional direct air capture (DAC) hubs ($3.5 billion). The latter are designated as hubs because they need to have their captured CO_2 stored or otherwise utilized. Projects will be selected based on geographic diversity, scalability, jobs, cost and other considerations to advance just and sustainable carbon dioxide reductions. Unlike DAC, a successful CCUS project needs an industrial or utility source of CO_2. $2.5 billion is allocated to the creation of a commercialization program for the development of large-scale carbon sequestration projects and associated transport infrastructure, plus $3.5 billion for two carbon capture demonstration and pilot programs and $2.1 billion for the Carbon Dioxide Transportation Infrastructure Finance and Innovation Program.

Electricity sector policies

RPS Policies

The Intermountain West states take a wide range of approaches to policies that encourage the deployment of low- and zero-emission electricity technologies. Along with variation in the fiscal policies described in the following sections, some states also deploy technology standards known as Renewable Portfolio Standards (RPS), which require in-state utilities to generate a certain proportion of their power using renewable sources such as wind and solar. These generate credits known as renewable energy certificates, which are typically tradable.

Table 9. Renewable portfolio standards		
State	**Target**	**Applies to**
Arizona	15% renewables by 2025	Investor-owned utilities (IOUs)
Colorado	100% zero-carbon by 2050	IOUs, municipal electrics (Munis), cooperative utilities (Co-ops)
Montana	15% renewables by 2015	IOUs
New Mexico	80% renewables by 2040 100% zero-carbon by 2045	IOUs, Co-ops
Utah	20% renewables goal* by 2025	IOUs, Munis, Co-ops
Wyoming	None	n/a

**Utah's policy is not a binding target. Source: DSIRE.*

Along with these standards, states may offer financial incentives that affect the deployment of clean electricity technologies, including taxes and subsidies. Technology-specific subsidies, such as tax incentives for wind or solar, will tend to speed deployment of these technologies but also limit the ability of governments to raise revenue for public services (notably, in states with binding RPS policies, it is unclear whether such subsidies would truly incentivize new construction or simply reduce costs for project developers). Conversely, technology-specific taxes will tend to inhibit deployment but have the benefit of raising new revenue to support government services.

Alongside these state policies, federal fiscal policy also shapes investment decisions, and in some cases overlaps with state policies. The following section provides an overview of major federal fiscal policies, then compares fiscal policies for each state with regards to electricity generation, transmission, distribution, storage, and consumption.

Tax incentives for renewable electricity generation

At the federal level, renewables are eligible for a variety of policies that reduce tax liability. These have been led by the renewable electricity production tax credit (PTC), which has primarily benefited wind energy; and the energy investment tax credit (ITC) which has primarily benefited solar. Other major provisions include income tax credits for holders of clean renewable energy bonds (CREBS), and accelerated depreciation provisions (Newell et al., 2019; Sherlock, 2021). The DOE Loan Program Office (LPO) also offers loan guarantees for qualifying innovative renewable electricity projects (DOE Loan Program Office, 2021).

At the state level, a variety of additional policies affect tax liability for renewable energy (RE) development, which typically incorporates wind, solar, geothermal, and biomass-based technologies. These credits may be offered to offset property, sales, income, or other tax liability.

Table 10. Tax incentives available for renewable electricity generation and manufacturing by state	
State	**Description**
Arizona	-25% personal income tax credit for residential solar/wind, up to $1,000. -100% state sales tax exemption for sales of solar equipment and installation for residential/commercial. May be subject to local sales taxes. -Up to $5 million corporate/personal income tax credit for RE projects with on-site consumption used in manufacturing. Minimum 20MW system. -Property tax incentive worth 80 percent of the original value of RE equipment. On-site generation is fully exempt.
Colorado	-RE equipment is exempt from state sales/use tax. May be subject to local sales taxes. -Residential RE (<2MW) is fully exempt from property taxes -Property tax valuation of facilities greater than 2 MW are capped at the valuation for a non-renewable plant of the same generating capacity. Local governments may offer additional incentives. Facilities less than 2 MW are assessed locally. -PACE financing available for commercial RE and EE investments.
Montana	-Residential and commercial RE facilities are eligible for a 100% property tax exemption for 10 years, worth up to $20,000 for single family and $100K for multi-family or nonresidential. -Utility-scale (>1MW) RE facilities are eligible for 10 years of reduced local property tax rates if approved by local government -Small scale (<1MW) RE facilities are eligible for a full exemption from property taxes for 5 years -Property tax abatement of up to 50% for RE manufacturing facilities. -Personal income tax credit worth up to $1,000 per household was available for residential RE, set to expire on 12/31/2021. -Personal or corporate income tax credit of 35% for investments of $5,000 or more in manufacturing RE equipment -Personal income tax credit of up to $1,500 for installation of residential geothermal heat pump or geothermal direct use

New Mexico	-Sales and installation of RE equipment are fully exempt from the state gross receipts tax (the state has no sales tax), up to $60 million. -RE and EV equipment manufacturers are eligible for a gross receipts tax credit of up to 5% of their qualified expenditures -Biomass/biofuels equipment and materials (including feedstock?) are exempt from paying state use taxes -Personal and corporate tax credit available for producers of biomass from a dairy or feedlot used for electricity generation or biofuels production. Worth $5/wet ton, max of $5 million statewide. Expired at the end of 2019. -Local governments are authorized to deploy PACE financing for commercial and residential RE (and energy efficiency) investments. -Residential rooftop solar is fully exempt from local property tax
Utah	-100% sales tax credit for purchases of "alternative" electricity generation equipment. Includes renewables, nuclear, and unconventional fossil resources. Minimum 2MW. -75% corporate tax credit on incremental revenue associated with renewable power generation, minimum 2MW. -Residential and commercial RE systems eligible for income tax credit, but program is phasing down and set to expire at the end of 2021. -PACE financing available for commercial RE and EE investments.
Wyoming	-Local governments are authorized to deploy PACE financing for residential RE and EE investments. -No other incentives identified.

Data sources: (DSIRE; Uebelhor et al., 2021). Includes biomass, geothermal, solar, and wind.

Wyoming currently levies an excise tax of $1.00 per megawatt-hour of electricity generated from wind turbines after three years of operation (WY Statutes § 39-22).

Energy storage policy

As states ramp up reliance on intermittent renewables such as solar and wind, large-scale battery storage can help provide load balancing, peaking, or other services.

Federal policies to support energy storage largely focused on support for early-stage research and development. However, the IIJA authorized roughly $500 million to support energy storage demonstration projects through two DOE programs established in 2020 (Section 41001 of DeFazio, 2021).

States have also begun implementing policies, typically through the utility regulation process, to support the deployment and use of energy storage, as described in Table 11.

Table 11. State policies supporting energy storage	
State	**Policy**
Arizona	Arizona Corporation Commission (ACC) directed utility Arizona Public Service to develop a program to use residential sited energy storage for demand response and load management. ACC institutes differential on-peak and off-peak ratcheted rates, incentivizing storage technologies to reduce energy bills. ACC votes to install energy storage with capacity of 5% of peak 2020 demand by 2035
Colorado	Colorado consumers can install, interconnect, and use energy storage systems on their property without restrictions, regulations, or fees. Colorado Public Utilities Commission requires utilities to include energy storage in their resource planning process Colorado Public Utilities Commission has been directed to establish mechanisms for utilities to procure energy storage in their resource planning processes.
Montana	Allows storage devices to be a part of net metering.
New Mexico	New Mexico Public Regulation Commission requires utilities to include energy storage in their resource planning
Utah	Public Service Commission has been authorized to approve an energy storage demonstration project
Wyoming	No policies identified

Data sources: (Pacific Northwest National Laboratory, Energy Storage Policy Database, 2021.)

Policies such as procurement targets (which exist in Colorado, California, and a few other states) are stronger incentives than other policies noted in the table above. Arizona and Colorado are leading the way with a combined 1,021.5 MW of energy storage installed, according to the Energy Storage Policy Database from Pacific Northwest National Laboratory.[20] This still pales in comparison to California's 4,147 MW system which is supported by a mandate within the state's RPS to install energy storage systems.

Tax incentives for nuclear energy

The federal government has offered a PTC for new nuclear generation in recent years, but no eligible facilities have entered into service to receive the credit to date. In addition, savings for the decommissioning of nuclear plants are subject to special tax treatment (Newell, Pizer, and Raimi 2019; Sherlock 2021). The Department of Energy's Loan Program Office has supported nuclear projects in previous years, and currently offers $10.9 billion in authority for loan guarantees for innovative nuclear projects (DOE Loan Program Office 2021a).

The IIJA provided some additional federal policy support for nuclear, including a provision to support the production of hydrogen from nuclear facilities (Section 40314 of DeFazio, 2021); financing and technical assistance for deployment of new nuclear technologies (Section 40321 of DeFazio, 2021); and up to $6 billion worth of tax credits for existing nuclear generators that are at risk of closure due to economic factors (Section 40323 of DeFazio, 2021).

Currently, only one nuclear reactor operates in the region: the Palo Verde plant, a 4-gigawatt (GW) plant in Maricopa County, Arizona. The plant's website states that it is the largest single taxpayer in the state of Arizona, contributing more than $50 million annually (Palo Verde Generating Station 2021). However, we were not able to independently verify this claim despite lengthy searches of records from the Maricopa County Assessor's and Treasurer's office, along with email inquiries to those offices. Records posted online by these offices indicate that the parcels upon which the plant is located have paid $0 in property taxes in recent years. However, the plant's owner may be making payments-in-lieu-of-taxes to the relevant local governments or may have some other arrangement for tax payment.

In Wyoming, legislation enacted in 2020 authorizes the state to grant permits for the construction of small nuclear reactors (SMRs) at sites where coal- or natural gas-fired power plants currently operate. The legislation also imposes a state excise tax of $5.00 per megawatt hour of net electricity generation

[20] https://energystorage.pnnl.gov/regulatoryactivities.asp

(i.e., excluding electricity used on-site) from commercial-scale SMRs, but excludes test- or pilot-scale plants (WY Statutes § 39-23).

Industrial/commercial sector policies

Many policies that would serve to reduce greenhouse gas emissions from industrial operations have been discussed in preceding sections, including the sections on CCUS, DAC, RD&D and electricity decarbonization. Below is a description of additional policies aimed directly at decarbonizing industrial operations in Intermountain West states, as well as some additional discussion of policies mentioned above.

Performance standards

The Clean Air Act (CAA) includes a number of regulations that address industrial emissions or operations. Currently, none of these are specifically designed to address GHGs. But we discuss CAA-related issues here because attempts to reduce conventional air pollutant emissions can have an ancillary effect on GHGs by increasing industrial efficiency and fuel-switching. For example, the CAA includes various limits on criteria air pollutants and hazardous air pollutants, which can impact process emissions and emissions from combustion in industrial operations. The CAA also includes specific limits on the amount of sulfur dioxide (SO_2) that can be emitted from industrial facilities nationwide (annual limit of 5.6 million tons), as well as emissions standards for specific technologies, including industrial boilers and stationary combustion diesel engines.[21] [22]

According to the U.S. EPA, the agency does have the authority to set CO_2 performance standards for industrial sectors, but other than rulemaking for reducing methane emissions (a powerful greenhouse gas), they haven't yet written GHG-based performance standards for industry (other than electricity generation). Many climate advocates are urging them to do so. Likewise, no states are engaged yet in this type of rulemaking.

The CAA also requires states to adopt enforceable plans (State Implementation Plans) to meet and maintain air quality standards; these plans must also control emissions that might drift downwind into other states. State Implementation Plans are required for each area designated as a nonattainment area (an area that has not met EPA National Ambient Air Quality Standards). Below is a table detailing

[21] The CAA requires industrial boilers and process heaters to meet certain emissions limits or comply with a regular period of equipment maintenance, and it requires that stationary combustion diesel engines meet specified nonroad diesel emissions standards.

[22] Clean Air Act Requirements and History | US EPA

the number of nonattainment areas throughout the region, many of which are home to industrial operations whose CO_2 emissions could be affected by conventional pollution reduction requirements.

Table 12. CAA nonattainment areas by state	
State	**Number of nonattainment areas designated**
Arizona	17
Colorado	2
Montana	7
New Mexico	2
Utah	7
Wyoming	1
Regional total	36

Source: SPeCS for SIPs Public Dashboard 1 (epa.gov)

In addition to emissions standards, the federal government issues energy efficiency standards—largely implemented by the Department of Energy—for technology and equipment utilized by industrial firms. Increased energy efficiency directly reduces CO_2 emissions to the extent fossil fuel use is reduced, either directly or indirectly through reducing electricity consumption.

Energy efficient standards cover a wide variety of standard energy technologies—from lighting to heat pumps and air conditioning—as well as more specialized technologies used in industrial operations such as boilers, electric motors and water pumps. There are currently 26 energy efficiency standards filed as commercial or industrial through the DOE, not including those standards which are cross-cutting, such as lighting. Each product follows a four-phase process, whereby existing standards are reviewed and new standards are developed.[23]

[23] Standards and Test Procedures | Department of Energy

Tax incentives and credits

CCUS tax credit

As mentioned above, in 2018, Congress passed section 45Q of the Internal Revenue Code authorizing a tax credit of up to $50/ton of CO_2 and other carbon oxides removed and permanently stored for approved projects. The IRA raised this credit to $85/ton. This credit could provide needed stimulus to install carbon capture technologies at industrial facilities, such as SMR-hydrogen production plants, particularly where storage sites are close to the carbon capture plants, or where CO_2 pipelines connect the source to a sink or use. However, unless a variety of legal and economic questions can be answered, particularly concerning CO_2 storage, 45Q may have only limited reach in the Intermountain West states; the higher credit amount works in the opposite direction, however. Wyoming and Montana may be leading the charge, with these states having legislation in place to address pore space ownership (Megan Cleveland, 2017).

Energy investment tax credit (ITC)

As discussed above, the Section 48 ITC is a major policy incentivizing solar energy deployment in the electricity sector. It also supports emissions reductions in broader industrial operations, for example by incentivizing investment in combined heat and power (CHP), waste energy recovery, fuel cells, and renewable energy generation at industrial facilities. Under the Section 48 ITC, CHP qualifies for a 10% credit, while waste energy recovery, fuel cells, and renewable energy generation qualify for a 30% credit.[24]

Modified Accelerated Cost Recovery System (MACRS)

MACRS is a tax benefit that allows firms to accelerate depreciation (which is a deductible business expense), so as to deduct higher amounts earlier in an asset's lifecycle as a way to reduce tax burden and incentivize investment. For industrial stakeholders, MACRS establishes a set of time periods ranging from 3-50 years over which the property may be depreciated. Especially relevant to industry, fuel cells, microturbines, CHP, solar-electric and solar thermal technologies are defined as five-year properties while biomass properties are defined as seven-year properties.[25] As these technologies can last much longer, the ability of firms to accelerate their depreciation deductions is an important tax benefit. Technology eligibility for the MACRS is defined by eligibility for the Energy Investment Tax

[24] https://crsreports.congress.gov/product/pdf/R/R46865

[25] https://www.epa.gov/chp/database-chp-policies-and-incentives-dchpp#ModifiedAcceleratedCostRecoverySystemMACRS

Credit. The MACRS is a smaller program compared to the ITC, only estimated to cost $0.3 billion from 2020-2024 (*Estimates of Federal Tax Expenditures for Fiscal Years 2020-2024*, 2020).

Advanced manufacturing tax credit

The section 48C advanced manufacturing tax credit[26] provides a 30% investment tax credit for investments in new or existing manufacturing facilities for the production of clean energy technologies. The credit applies to equipment and facilities that manufacture a variety of clean energy related technologies, including renewable energy generation (such as wind, solar, and geothermal technologies), electric grid, energy storage, electric vehicle, CCUS, energy conservation, and other technologies.

The tax credit allocated all $2.3 billion in credits through two application rounds which ended in 2013.[27] However, the IRA included an additional $10 billion for 48C. Further, IRA included a direct-pay option, which would put cash in the hands of manufacturers, rather than tax credits.[28] This provision would give manufacturers with low tax liability the ability to claim the full value of the 48C incentive without finding high tax liability partners through tax equity markets (which often reduces the value of the incentive for the intended recipient—clean energy manufacturers—due to tax equity transaction costs).

Energy Efficiency Incentives

The federal Energy Policy Act of 2005 established the Energy Efficient Commercial Buildings Tax Deduction (179D), which applies to the industrial sector (as a component of the commercial sector). 179D offers a tax deduction of $1.80 per square foot for the owners of new or existing buildings that install technology to reduce total building energy and power cost by 50% or more compared to a building energy performance benchmark determined by the most recent ASHRAE 90.1 standard. The tax deduction also offers $0.60 per square foot to owners of buildings where technologies like lighting, heating, and cooling systems meet target levels that would reasonably contribute to the building's saving of 50% if additional systems were installed.[29]

The ENERGY STAR program, a voluntary performance standard to promote energy efficiency best known for household appliances, can also grant certificates to industrial plants meeting an EPA

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[26] 26 USC 48C

[27] Biden Administration's proposals would expand and enhance qualifying advanced energy manufacturing credit (ey.com)

[28] Inflation Reduction Act Offers Significant Tax Incentives Targeting Energy Transition and Renewables | White & Case LLP (whitecase.com)

[29] DSIRE (dsireusa.org)

determined energy performance rating.[30] As DOE minimum efficiency standards are updated, the requirements to become ENERGY STAR certified are also adjusted. Plants must be in the top 25th percentile of all plants in energy efficiency to achieve ENERGY STAR certification. In the Intermountain West, there are 12 certified plants including facilities for commercial bread and roll-baking, cement manufacturing, and nitrogenous fertilizer production. Although the program is voluntary, industrial plants looking to be included in Buy Clean or green procurement initiatives have an incentive to participate, or at least disclose their ENERGY STAR score as a signal of their low CO_2 emissions.

The DOE Loan Guarantee Program has an energy-efficiency angle, too. The program awards loan guarantees to commercial projects that adopt energy efficient technologies.

At the state and municipal level, one strategy for advancing commercial and industrial building energy efficiency is to adopt and enforce the International Energy Conservation Code (IECC). For example, Colorado requires local governments to adopt and enforce the IECC,[31] and many Arizona local jurisdictions have adopted it as well.[32] Table 13 highlights some examples (not an exhaustive list) of state government incentives for energy efficient commercial and industrial buildings.

Table 13. Examples of energy efficiency programs for commercial and industrial buildings by state

State	Policy
Arizona	Property tax exemption is available for energy efficient building components.
Colorado	Offers several programs to finance energy efficient commercial properties and Property Assessed Clean Energy (PACE) financing.
Montana	Offers tax credits and deductions for energy efficiency investments.
New Mexico	Offers a sustainable building tax credit, bonds for energy efficiency investments, and PACE financing.
Utah	Offers a commercial PACE program.
Wyoming	Offers one loan program and several grant programs for energy efficiency.

S*ource: The State Energy Efficiency Scorecard | ACEEE*

[30] ENERGY STAR plant certification | ENERGY STAR

[31] CO HB 19-1260

[32] ACEEE_ScrSht20_Arizona.pdf

Additionally, many states require public buildings to be held to an energy efficiency standard, potentially paving the way for future commercial and industrial buildings to be held to the same standard.

As indicated by Table 13, one common state program seen in the Intermountain West is a Property Assessed Clean Energy (PACE) program. The PACE model is a mechanism for financing energy efficiency and renewable energy improvements to private property—both commercial and residential. PACE programs allow the property owner to finance the upfront cost of energy efficiency improvements and pay back the costs over time through voluntary tax assessment on the property.[33]

Direct funding and subsidized finance

DOE Advanced Manufacturing Office (AMO) funding

The AMO aims to drive decarbonization, innovation, and productivity improvements in the U.S. manufacturing sector by focusing on applied RD&D in a variety of technologies and production processes. The 2022 budget imposes a new structure including four new program areas (Materials, Manufacturing Innovations, Energy Systems, and Manufacturing Enterprise).

Materials: the materials subprogram focuses on developing new materials with improved sustainability and energy performance properties. This goal is pursued by investments and demonstration activities supported by the AMO to help technologies scale-up and to accelerate adoption and deployment. Funding for the materials subprogram under AMO includes competitive selection of R&D projects at national labs, universities, and companies, and the continuation of consortiums to develop new energy-related materials.

Manufacturing Innovations: this subprogram focuses on advancing new manufacturing technologies and processes, and on improving energy efficiency, with the goal of decarbonizing the manufacturing process. This goal is also supported by RD&D programs, including funding for the continuation of the Clean Energy Manufacturing Innovation (CEMI) Institute, competitive selection and support of projects focused on decarbonization, and competitive selection and support of projects focused on modelling, simulation, and data analysis.

Energy systems: this subprogram focuses on advancing systems for energy conversion, utilization, storage, and management within industry. This subprogram specifically targets combined heat and power (CHP) and resiliency systems. The program operates by providing technical assistance to support

[33] Property Assessed Clean Energy Programs | Department of Energy

RD&D and collaboration with the DOE Hydrogen and Fuel Cell Technologies Office (HFTO) on a funding opportunity focused on electrolyzer manufacturing.

Manufacturing enterprises: this subprogram focuses on value chain adaptability, responsiveness, and resilience during disruption, change, and opportunity. The program supports technical assistance and stakeholder engagement through competitive selection of projects focused on topics like energy and water efficiency, waste reduction, decarbonization, workforce development, and smart manufacturing. The program supports competitive funding, a workforce training program, technical assistance, and educational resource development.[34]

Through these four subprograms, the AMO provides funding and support through a variety of channels for a variety of programs ranging from RD&D to job training and educational resource development. AMO specifically focuses on technical areas with high potential for impact.

USDA Business & Industry Loan Guarantee Program and tax-exempt bonds

In addition to the DOE Loan Guarantee Program discussed above, the recently established USDA Business & Industry (B&I) Loan Guarantee Program provides loan guarantees to support the availability of low-cost capital for decarbonization investments at industrial operations located in rural areas. Borrowers can be cooperative organizations, corporations, partnerships, federally recognized tribal groups, for-profit and non-profit organizations so long as the area is eligible as rural.[35]

Other federal policies that subsidize finance in ways that could be relevant for industrial decarbonization include tax exempt Private Activity Bonds [36] (issued by state and local governments and exempt from federal taxes), the tax credit bonds listed above in Section 3, the U.S. EPA's Clean Water State Revolving Loan Fund, U.S. Treasury's CDFI Fund and in some cases the various financing programs offered by the Small Business Administration.

Green procurement

As a means of stimulating demand for green (low carbon) products to bring prices down through economies of scale and innovation, governments around the world are creating green procurement programs that include provisions for carbon-intensive commodities produced by the industrial sector, such as steel, cement, and paper. The Biden administration issued an Executive Order directing federal

[34] FY 2022 Budget Request Vol 3.1 (energy.gov)

[35] Database of CHP Policies and Incentives (dCHPP) | US EPA

[36] RL31457 (congress.gov)

agencies to develop the tools and protocols to implement a green procurement program for commodities routinely purchased and supported by the federal government—including those used in the construction of roads, bridges, and buildings. The term "supported by" is very important, as it would imply that $49 billion a year distributed by the federal government to states under the Federal Highway Trust Fund could come with requirements that the states incorporate the same program in their bidding procedures for highway construction paid for, in part, with federal money.

The General Services Administration is also implementing embodied carbon requirements in its procurement programs for cement and concrete products. Hence, all public infrastructure projects, including those funded under the IIJA, will be held to GWP thresholds based on product-specific EPDs. These carbon content requirements for federal procurement of cement and concrete products, aligned with the new White House Buy Clean Policy,[37] are the first to apply nationwide. The IRA has funded the extra effort and cost of these Buy Clean efforts.

State green procurement programs, such as the Buy Clean California Act,[38] could also be an important factor in industrial decarbonization. Buy Clean California implements embodied carbon limits for a selection of building materials (steel products, flat glass, and mineral wood board insulation)[39], which must not exceed the Global Warming Potential (GWP) threshold set by the Procurement Division of the Department of General Services, when procured in public construction projects. The required GWPs for eligible materials were set using industry-wide Environmental Product Declarations (EPDs).

On the east coast, the New York State Green Procurement and Agency Sustainability Program has included low carbon concrete specifications since April 2022. Under this policy, the State requires concrete manufacturers to provide batch-specific EPDs when available, and to supply products complying with a specified cement-to-concrete ratio and a specified share of Supplementary Cementious Materials in the final mix. In addition, contractors have to reduce their use of cement overall by using blended aggregates.

Technical assistance

Identifying the most effective and economical approaches for reducing industrial emissions can be complicated, and federal programs exist to assist firms navigating this process. For example, DOE's

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[37] https://www.whitehouse.gov/briefing-room/statements-releases/2022/02/15/fact-sheet-biden-harris-administration-advances-cleaner-industrial-sector-to-reduce-emissions-and-reinvigorate-american-manufacturing/#:~:text=Launching%20%E2%80%9CBuy%20Clean%E2%80%9D%20Procurement&text=As%20directed%20by%20the%20President's,stage%20of%20the%20manufacturing%20process.

[38] https://www.dgs.ca.gov/-/media/Divisions/DGS/LegReports/Accessible-Reports/2022/BCCA-Legislative-Report_final.pdf?la=en&hash=C970382B9DC8530385F0F0FFCD1928D2B7533B99

[39] A 2021 amendment, currently on hold, would include concrete as well.

Advanced Manufacturing Office (AMO) has housed programs (e.g. R&D Consortia) to pair firms with university-based student-led industrial assessment centers. DOE also develops software to help companies plan energy efficiency and other facility upgrades, including the Manufacturing Energy Assessment Software for Utility Reduction (MEASUR) and 50001 Ready.[40]

Fuels policy

Tax incentives

Hydrogen

The IRA created a new program to provide tax credits for the production of "clean" hydrogen (giving stimulus to carbon capture and storage applied to standard hydrogen production facilities (blue hydrogen) and hydrogen produced with electrolysis or other new technologies (green hydrogen), the tax credit would be larger the lower the CO_2 emissions per unit of hydrogen produced. The lowest hanging fruits for fuel "switching" are (1) replacing grey with blue hydrogen and using the blue hydrogen as current hydrogen is now used (e.g., fertilizer manufacturing), and (2) combining blue or green hydrogen with natural gas for distribution to electric utilities (up to a 20% mixture (10% by btus)), and perhaps marine transport and even truck transport.

Bioenergy

Fostering the development of bioenergy has been seen as a potential path to decarbonizing multiple sectors of the economy. From biofuels in the transportation sector to biobased displacement of chemical production in the industrial sector, bioenergy presents an opportunity for progress in operations which are otherwise difficult to decarbonize.

Procurement of bioenergy is often included as an option when satisfying renewable portfolio standards. All Intermountain West states except Wyoming with a current or past RPS allow for bioenergy to count towards the renewables share.

[40] https://www.aceee.org/sites/default/files/pdfs/ie2001.pdf

Table 14. State tax policies supporting bioenergy	
State	**Policy**
Arizona	Reduced tax burden for utility-scale biomass equipment
Colorado	Reduced property tax burden for renewable energy property Local tax exemptions for renewable energy systems
Montana	Property tax exemptions for biomass and biogas generation Property tax abatement for bioenergy
New Mexico	Renewable energy Production Tax Credit Tax deduction for biomass feedstock and production equipment Energy equipment manufacturing tax credit
Utah	Tax credit for biomass energy PTC for biomass generation Tax credit for renewable and commercial biomass energy systems
Wyoming	No policies identified

Arizona offers a reduced tax footprint of 20% of "taxable original cost" for utility scale renewable energy equipment which includes biomass.[41]

The state of Colorado has included biogas requirements for gas utility decarbonization within its GHG Pollution Reduction Roadmap. The Colorado roadmap suggests considering a Biogas Portfolio Standard, which would require gas utilities to satisfy a greenhouse gas intensity standard. The roadmap also mentions utility biogas incentives for the waste industry as a near-term action towards decarbonization. A number of Colorado localities offer property, sales, and use tax exemptions for bioenergy generators.[42] Colorado also assesses renewable energy property at a reduced value for state property tax burden.[43]

[41] https://www.azleg.gov/viewdocument/?docName=https%3A%2F%2Fwww.azleg.gov%2Fars%2F42%2F14155.htm

[42] https://programs.dsireusa.org/system/program/co/biomass

[43] https://cdola.colorado.gov/renewable-energy

Montana offers property tax exemptions for biomass and biogas through both the Generation Facility Corporate Tax Exemption and the Renewable Energy System Exemption.[44,45] Bioenergy facilities in Montana are also offered property tax abatement up to 50% for up to 19 years of construction and operation.[46]

New Mexico offers the Renewable Energy Production Tax Credit worth $0.01 per kWh which is applicable to biomass. The state also provides a deduction of compensating tax for biomass feedstocks and production equipment.[47] The Alternative Energy Product Manufacturers Tax Credit can be used for energy equipment manufacturers, including renewable bioenergy, with a value of 5% of qualified expenditures.[48] New Mexico also has an agricultural biomass income tax credit which offers a $5 per ton of biomass tax credit for dairy or feedlot owners that supply feedstock to biomass generators.[49]

Utah's Alternative Energy Development Incentive offers a credit to cover 75% of "new eligible state revenues" from biomass projects for 20 years.[50] Utah also has a PTC worth $0.0035 per kWh for biomass generation for the first 48 months of project operation.[51] The Renewable Energy Systems Tax Credit also offers a variable tax credit for residential and commercial renewable energy systems, including biomass, though the residential credit expires in 2023.[52]

The federal government has several active projects promoting the adoption of bioenergy. USDA runs the Biorefinery, Renewable Chemical, and Biobased Product Manufacturing Assistance Program, providing loan guarantees for retrofitting, construction, or development of advanced biofuels, renewable chemicals, and bioproducts.[53] USDA also operates the Repowering Assistance Biorefinery Program which offers financial incentives for converting fossil fuel generators to a biomass.[54]

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[44] https://leg.mt.gov/bills/mca/title_0150/chapter_0060/part_0020/section_0240/0150-0060-0020-0240.html

[45] https://leg.mt.gov/bills/mca/title_0150/chapter_0060/part_0020/section_0250/0150-0060-0020-0250.html

[46] https://leg.mt.gov/bills/mca/title_0150/chapter_0240/part_0310/section_0110/0150-0240-0310-0110.html

[47] https://nmonesource.com/nmos/nmsa/en/item/4340/index.do#!fragment/zoupio-_Toc100337805/BQCwhgziBcwMYgK4DsDWszIQewE4BUBTADwBdoAvbRABwEtsBaAfX2zgEYAGLgZl4DsADi4BWAJQAaZNlKEIARUSFcAT2gByDZIiEwuBEpXqtOvQZABlPKQBC6gEoBRADJOAagEEAcgGEnkqRgAEbQpOzi4kA

[48] https://law.justia.com/codes/new-mexico/2013/chapter-7/article-9j/

[49] https://nmonesource.com/nmos/nmsa/en/item/4340/index.do#!fragment/zoupio-_Toc100336950/BQCwhgziBcwMYgK4DsDWszIQewE4BUBTADwBdoAvbRABwEtsBaAfX2zgEYAGLgZl4BsATgCsXAJQAaZNlKEIARUSFcAT2gByDZIiEwuBEpXqtOvQZABlPKQBC6gEoBRADJOAagEEAcgGEnkqRgAEbQpOzi4kA

[50] https://energy.utah.gov/tax-credits/aedi/

[51] https://energy.utah.gov/tax-credits/renewable-energy-systems-tax-credit/utility/production-tax-credit/

[52] https://energy.utah.gov/tax-credits/renewable-energy-systems-tax-credit/

[53] https://www.rd.usda.gov/programs-services/energy-programs/biorefinery-renewable-chemical-and-biobased-product-manufacturing-assistance-program

[54] https://www.rd.usda.gov/directives/4288-repowering-assistance-payments-eligible-biorefineries

Table 15. USDA bioenergy investment by state	
State	**Total investment ($Million)**
Arizona	129.3
Colorado	14.2
Montana	16.0
New Mexico	55.6
Utah	51.7
Wyoming	3.9

Note: Bioenergy includes renewable biomass and anaerobic digester.[55]

The USDA provides information on investment expenditures by state for programs assisting bioenergy development. Of the states under assessment by I-WEST, Arizona has received the most in bioenergy investment funds. The majority of USDA bioenergy investment in both Arizona and New Mexico was towards anaerobic digestion development. Utah, which has also seen sizeable investment from USDA, has had its investment go towards renewable biomass.

Biofuels

Wyoming was the third largest state producer of biofuels in 2021, with a capacity of 8 million barrels per day (mb/d). Colorado currently has three fuel ethanol plants with combined capacity of 9 mb/d, while Arizona has one plant with 4 mb/d in capacity.[56]

Montana provides a $0.20 per gallon subsidy for ethanol production, contingent on a percentage of the input products being sourced from Montana.[57] The state also exempts property tax for ethanol production facilities during construction plus 10 years afterwards.[58] Montana offers a $0.02 per gallon fuel tax refund for distributors of biodiesel completely sourced from Montana.[59] The "Clean and Green" Property Tax Incentive may also offer a lower tax rate of 3% of market value for biomass, biogas, and

[55] https://www.wctsservices.usda.gov/energy/maps/investment

[56] https://www.eia.gov/petroleum/ethanolcapacity/

[57] https://leg.mt.gov/bills/mca/title_0150/chapter_0700/part_0050/section_0220/0150-0700-0050-0220.html

[58] https://leg.mt.gov/bills/mca/title_0150/chapter_0060/part_0020/section_0200/0150-0060-0020-0200.html

[59] https://leg.mt.gov/bills/mca/title_0150/chapter_0700/part_0040/section_0330/0150-0700-0040-0330.html

biofuel generation and production facilities.[60] These facilities are also offered property tax abatement up to 50% for up to 19 years of construction and operation.[61]

New Mexico offers a deduction of biomass feedstocks and production equipment used for biofuel production towards the compensating tax.[62] New Mexico also offers a Biodiesel Blending Facility Tax Credit with value up to 30% for the purchase and installation cost of 2% or higher biodiesel blending equipment.[63]

In 2021, a group of federal agencies led by the DOE, DOT, and USDA started the Sustainable Aviation Fuel Grand Challenge as a MOU towards increasing the sustainability and production of sustainable aviation fuels. The challenge has the goal of reaching 3 billion gallons of sustainable aviation fuels by 2030, and 35 billion gallons per year—the estimated total U.S. aviation fuel demand—by 2050.[64]

The DOE Bioenergy Technologies Office (BETO) and NREL created the Waste-to-Energy Technical Assistance for Local Governments (WTE) program in 2021, with the city and county of Denver, Colorado being the first recipient in the Intermountain West region. The WTE program provides assistance and planning services for biowaste project implementation. USDA manages the Advanced Biofuel Payment Program aimed at boosting biofuel production.[65] This USDA program is a purchasing program for, with payment amounts subject to the program's annual budget. USDA also operates the Higher Blends Infrastructure Incentive Program which provides grants to businesses for biodiesel distribution infrastructure, such as upgraded fuel dispensers or storage systems.[66]

Beyond direct project assistance, numerous experts and stakeholders have noted the importance of community education and engagement to ensure community acceptance of new technologies and industry.

The Build Back Better legislation would extend incentives for biodiesel, renewable diesel and alternative fuels through 2026, as well as establish a sustainable aviation fuel tax credit.

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[60] https://deq.mt.gov/energy/resources#CleanGreen

[61] https://leg.mt.gov/bills/mca/title_0150/chapter_0240/part_0310/section_0110/0150-0240-0310-0110.html

[62] https://nmonesource.com/nmos/nmsa/en/item/4340/index.do#!fragment/zoupio-_Toc100337805/BQCwhgziBcwMYgK4DsDWszIQewE4BUBTADwBdoAvbRABwEtsBaAfX2zgEYAGLgZl4DsADi4BWAJQAaZNlKEIARUSFcAT2gByDZIiEwuBEpXqtOvQZABlPKQBC6gEoBRADJOAagEEAcgGEnkqRgAEbQpOzi4kA

[63] https://nmonesource.com/nmos/nmsa/en/item/4340/index.do#!fragment/zoupio-_Toc100337755/BQCwhgziBcwMYgK4DsDWszIQewE4BUBTADwBdoAvbRABwEtsBaAfX2zgEYAGLgZl4DsAgKzCAlABpk2UoQgBFRIVwBPaAHJ1EiITC4Ei5Ws3bd+kAGU8pAEJqASgFEAMo4BqAQQByAYUcTSMAAjaFJ2MTEgA

[64] https://www.energy.gov/eere/bioenergy/sustainable-aviation-fuel-grand-challenge

[65] https://www.rd.usda.gov/programs-services/energy-programs/advanced-biofuel-payment-program

[66] https://www.rd.usda.gov/hbiip

Development opportunity assessment

The Wyoming Pipeline Corridor Initiative is working to expand rights of way over additional CO_2 pipelines across federal lands.

Pricing externalities

The most important piece of the policy puzzle for fossil fuels from a decarbonization point of view is that most externalities are unpriced by the federal government and most states (Coady et al., 2019). These externalities include, but are not limited to, the health impacts of air quality damages from fuel combustion; climate damages from carbon dioxide and methane emissions; water quality degradation associated with petroleum spills, coal combustion residuals, and oilfield waste management; and habitat fragmentation. California and New England have carbon pricing programs.

In addition to implicit subsidies from failing to price externalities, fossil fuel production is explicitly subsidized in the U.S., primarily through state and federal tax codes. These implicit and explicit subsidies, combined with the fact that fossil fuels generate substantial revenues for some of the Intermountain West states, makes fossil fuel policy relevant to the I-WEST assessment. Broadly speaking, current policies in most of the states towards fossil fuel extraction are likely to impede decarbonization efforts.

Subsidies to oil and gas

At the federal level, oil and gas extraction is subsidized through the tax code in a variety of ways. Some of these incentives are related to CCUS and EOR, which we discuss above. Other incentives are more broadly applicable, and include (1) amortization of costs associated with exploration for new resources, estimated to result in forgone revenues of $500 million from FY20-FY24; (2) tax exemptions for publicly-traded energy firms that are classified as partnerships, estimated to result in foregone revenues of $1.8 billion from FY20-FY24; (3) expensing of intangible drilling costs and other costs, estimated to result in foregone revenues of $2.3 billion from FY20-FY24; and (4) the allowance of percentage (instead of cost) depletion, estimated to result in foregone revenues of $2.9 billion from FY20-FY24 (*Estimates of Federal Tax Expenditures for Fiscal Years 2020-2024*, 2020).

Analyses of these policies have found that they do relatively little to boost oil and gas production despite their substantial costs. Because they lower the costs of producing fossil fuels, they also will tend to exacerbate greenhouse gas emissions and other pollution associated with consuming these fuels (Aldy, 2021; Metcalf, 2017; Murray et al., 2014).

At the state level, additional incentives provide financial support for fossil fuel extraction. These include incentives for low-producing oil and natural gas wells (often referred to as "stripper wells," because they "strip" the small quantities of recoverable resources from the well), which vary across states, and could take the form of reduced state severance and/or local property tax rates. Some states also offer reduced severance tax rates to encourage investments in new production.

For example, the first 18 months of oil and gas produced from a new horizontally drilled well in Montana is subject to a severance tax rate of 0.5%, after which it pays a 9% rate. Given the fact that horizontally drilled wells are most productive in their first months and years of production, this incentive results in considerable foregone revenue for the state (Montana Code Annotated §15-36-304).

Subsidies to coal

Certain types of coal production are subsidized at the federal level. The most significant policies are the "refined coal" tax credit (just expired) and a credit worth $2.00 per ton (in 2005 dollars) for coal produced by "Indian Tribes" or from land held in trust for a tribe by the federal government (26 USC §45). From FY20 through FY24, this latter subsidy was projected to result in $200 million in foregone tax revenues. Construction of new integrated gasification combined cycle systems and other advanced coal technologies have been eligible for investment tax credits worth 15 to 30 percent of the investment (26 USC §48A and §48B). From FY20-FY24, this subsidy was projected to result in $1.2 billion in foregone tax revenues. Another substantial subsidy taxes income from certain coal sales at the 20% capital gains tax rate, rather than the higher ordinary income tax rate (26 USC §631(c)). This provision is estimated to result in $1.6 billion in foregone federal revenues from FY2020 through FY2029. Finally, many coal-fired power plants are able to amortize their investments in certain pollution control equipment, resulting in foregone revenues of $2.1 billion from FY20-FY24 (Sherlock, 2021).

Although little empirical analysis is available to assess the environmental or economic effects of these policies, one recent analysis raises concern. It estimates that the "refined coal" tax credit achieves roughly half of its intended air pollution reduction benefits, and that the social costs of the policy are more than seven times the benefits (Prest and Krupnick, 2020). Even though the credit expired, it could return.

Declining fossil fuel revenues

Although fossil fuels are heavily subsidized, both explicitly and implicitly, at the federal and state levels, they also play a major role in funding public services in most Intermountain West states. Coal, oil, and natural gas extraction, transportation, processing, and use each contribute substantially to local, state, tribal, and federal coffers. Revenues are generated through a variety of mechanisms, led by

excise taxes on petroleum product (e.g., gasoline and diesel) consumption, severance taxes on fossil fuel extraction, leasing revenue from production on public lands, and property taxes on extraction, transportation, refining, and power plant property (Raimi et al., 2022).

As decarbonization reduces the level of fossil fuel production and consumption across the economy, public revenues from these sources are likely to decline as well, potentially posing fiscal risk for dependent localities, states, and Native nations. The table below provides three metrics to assess the scale of revenue from fossil fuels in the states. It averages annual data from 2015 through 2020, and includes (1) aggregate state and local revenue from fossil fuels, (2) per capita state and local revenue from fossil fuels, and (3) state and local revenue from fossil fuels as a share of total own-source income (i.e., excluding federal transfers).

Table 16. Average annual state revenues from fossil fuels, 2015-2020

State	Aggregate revenue ($millions)	Per capita revenue	Share of own-source revenue	Main sources
Arizona	$844	$117	1.7%	Petroleum products
Colorado	$2,000	$356	4.1%	Oil, gas, petroleum products
Montana	$644	$613	7.9%	Oil, gas, petroleum products
New Mexico	$2,726	$1,303	15.1%	Oil, gas, petroleum products
Utah	$807	$260	3.1%	Oil, gas, petroleum products
Wyoming	$4,264	$7,339	58.6%	Oil, gas, coal

Source: Raimi et al. (2022)

At roughly 59%of own-source revenues, Wyoming is by far the most dependent state on fossil fuels to provide government services in the region and, in fact, the nation as a whole (Raimi et al., 2022). However, New Mexico is also highly dependent as a state, and certain regions of Colorado, Montana, and Utah where fossil fuel extraction is concentrated are also very dependent on fossil fuels to provide critical local services, particularly education.

Decommissioning mines and wells

As the U.S. moves towards decarbonization, the infrastructure that has provided fossil fuels and managed their waste products will need to be safely decommissioned and monitored over time. In some cases, federal and state policies have insufficiently planned for the costs associated with these

activities. Without near-term policy reform, state and federal taxpayers may be shouldered with tens of billions of dollars of decommissioning liabilities.

In the coal sector, major concerns exist around reclaiming abandoned mines and the impoundments that store coal combustion residuals (sometimes referred to as "coal ash"). The Intermountain West is home to a large number of abandoned mines, including coal mines. Safely decommissioning these sites has the potential to provide near-term employment and support longer-term economic development by reducing exposure to pollution in surrounding communities (Raimi, 2020).

Table 17 identifies the number of abandoned mines in the region and their associated costs. "Unfunded costs" refer to expected reclamation costs that are not currently funded, while "funded" and "completed" costs refer to reclamation needs that are either funded or completed, respectively.

Table 17. State and tribal abandoned mine inventories and costs ($millions)

State/Tribe	Abandoned mines	Unfunded costs	Funded costs	Completed costs
Arizona	1	$-	$-	$-
Colorado	1,589	$74	$1	$69
Crow	166	$-	$2	$10
Fort Peck	15	$-	$2	$2
Hopi	49	$2	$-	$4
Montana	2,111	$225	$1	$103
Navajo	1,281	$1	$3	$34
New Mexico	458	$42	$2	$33
Utah	591	$8	$1	$33
Wyoming	3,574	$104	$202	$750

Data source: OSMRE (2021), Data accessed 4/19/2022.

The table highlights the relatively large number of abandoned mines and liabilities in Montana, Wyoming, Colorado, and New Mexico. The IIJA authorized $11.3 billion in federal spending to reclaim abandoned mines across the United States (Section 40701 of DeFazio, 2021).

In the oil and gas sector, state policies have failed to fully incentivize operators to decommission wells at the end of their useful lives. State governments require oil and gas well operators to provide some form of financial assurance (e.g., a surety bond) that can be used to decommission that company's wells if the company goes bankrupt. States also offer so-called "blanket" bonds that provide financial assurance for every well operated by a given company in that state. In the Intermountain West,

maximum blanket bond levels range from $50,000 to $250,000 (Table 18).

Table 18. Unplugged orphaned oil and gas wells by state		
State	**Documented unplugged orphaned wells**	**Maximum blanket bond**
Arizona	0	$250,000
Colorado	409	$100,000
Montana	221	$50,000
New Mexico	652	$250,000
Utah	72	$60,000
Wyoming	1,323	$100,000

Source: U.S. Geological Survey, 2022

These blanket bonds are woefully inadequate to cover decommissioning costs for operators that own more than one or two wells. One recent empirical analysis estimates that, on average, decommissioning an oil and gas well costs roughly $76,000, with a small number of wells exceeding $1 million (Raimi et al., 2021). Although some states charge a small annual fee to all oil and gas companies to help cover the costs of decommissioning so-called "orphaned" wells (those whose owners have gone bankrupt), the backlog of such wells has increased over time. Ultimately, decommissioning liabilities not covered by financial assurance instruments or these annual fees will fall on taxpayers.

In the IIJA, Congress authorized roughly $4.7 billion to support orphaned well decommissioning and related activities across the country (Section 40601 of DeFazio, 2021). This investment, if decommissioning costs were roughly $76,000 per well, would only cover roughly 60,000 wells. Nationwide, the current, and potential future, number of orphaned wells is at least an order of magnitude higher (Kang et al., 2021), suggesting that reform to state and federal financial assurance requirements are needed to prevent taxpayers from footing tens to hundreds of billions in future decommissioning costs.

Other

Although not directly tied to decarbonization, it is useful to know how the six states compare in the comprehensiveness and stringency of their oil and gas regulations. Indirectly, regulations on

abandoned wells affect methane emissions and other regulatory areas also affect those emissions and CO_2. Krupnick and Richardson (2013) compared regulatory performance for shale gas for all states but Arizona in the region. Their findings include: (Figure 3) Colorado and New Mexico regulate more or the 25 elements considered than Wyoming, Utah, and Montana, in that order, with the national average being higher than Utah and Montana.

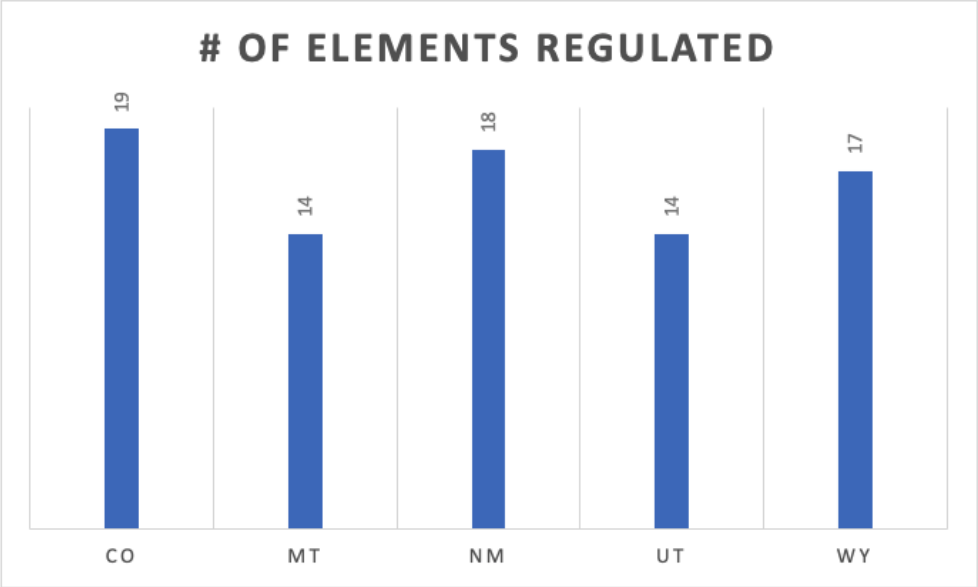

Figure 3: Number of elements considered in regulation.

Of the 25 elements, 13 can be measured quantitatively and compared. Of these, Colorado regulates 12, Wyoming 8, New Mexico 7, Utah 6, and Montana 5.

Of the elements regulated quantitatively, Montana is most stringent, followed by Utah, then New Mexico, Colorado, and Wyoming. In terms of qualitative elements (Figure 4), Krupnick and Richardson also rated the states on stringency. Colorado was first, followed by New Mexico, Wyoming, Montana and Utah.

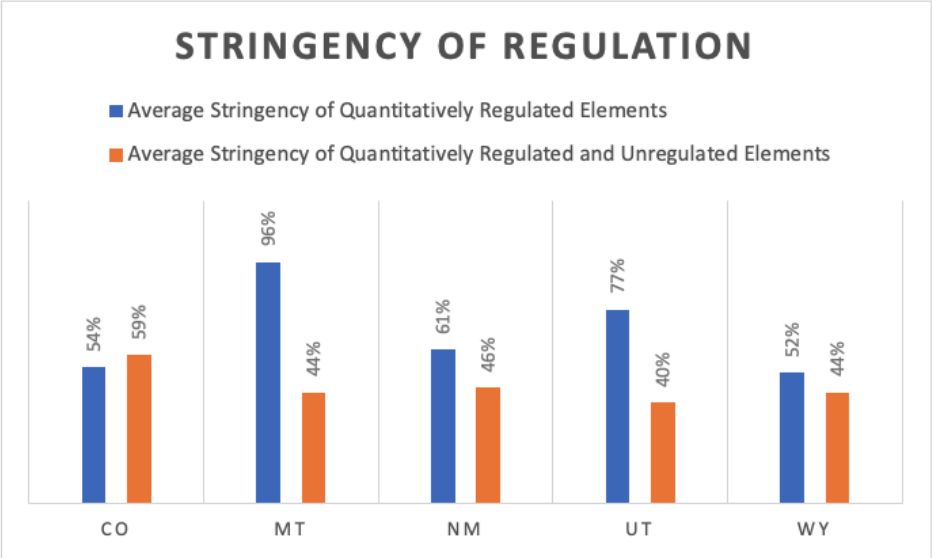

Figure 4: Stringency of regulation.

In addition to these summary measures, they examined and compared particular regulations. One relevant to methane leaks in casing and cement depth. Figure 5 shows that the states within the region take very different approaches.

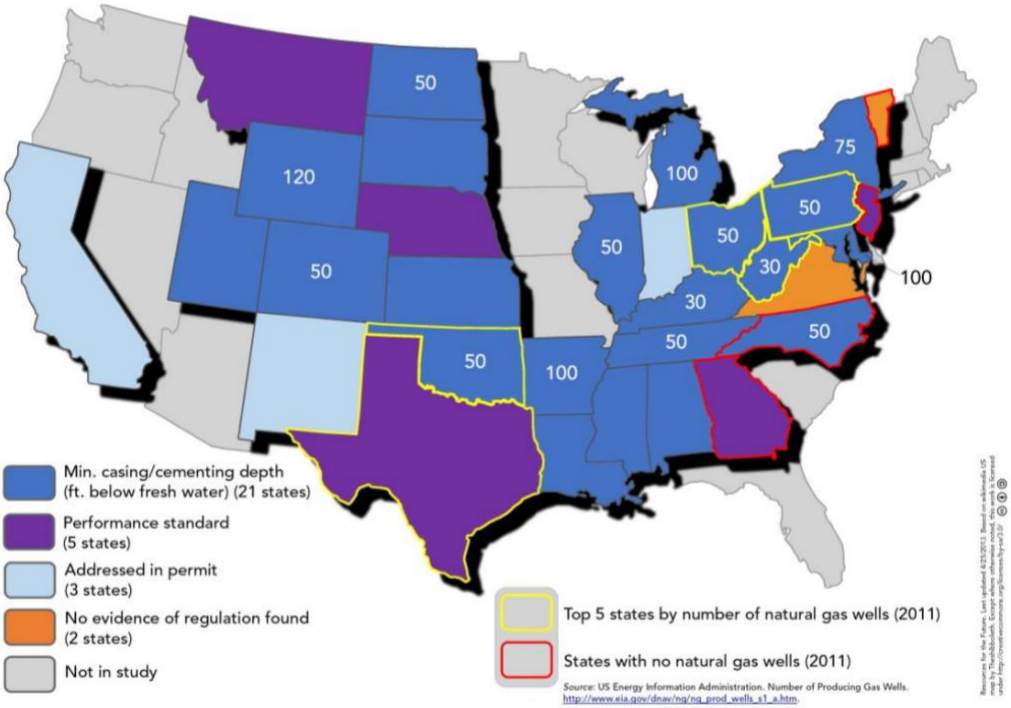

Figure 5: Casing and Cementing Depth Regulations (Krupnick and Richardson 2013).

Another relevant rule is on flaring (Figure 6).

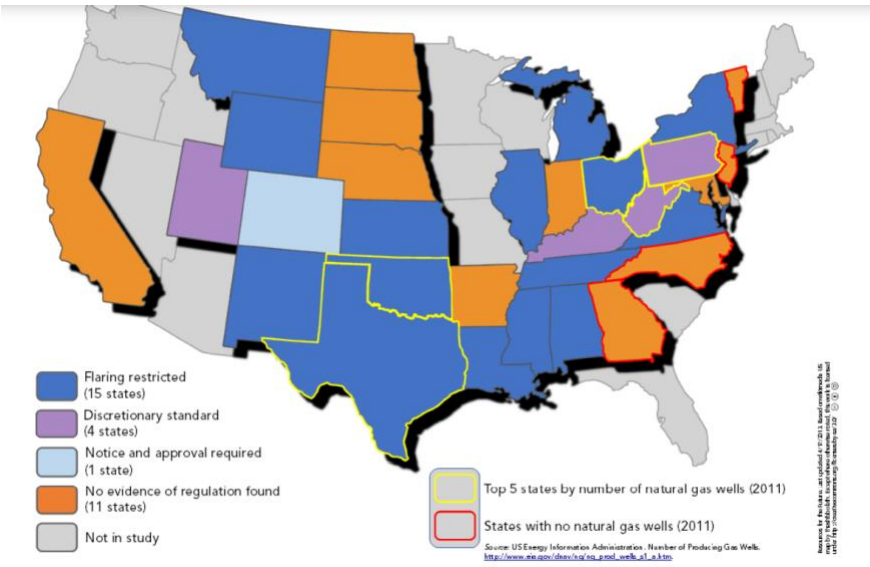

Figure 6: Flaring regulations (Krupnick and Richardson 2013).

Figure 7 shows severance tax rates. Higher rates are presumably more beneficial to the economy in creating more tax revenues per mcf produced and may be somewhat of a disincentive to production. Notably, the figure does not show local property taxes, which vary widely across states and which interact with state-level severance tax policies, sometimes reducing the effective rate of the severance tax (as in Colorado). Figure 7 is illustrative of the heterogeneity of approaches.

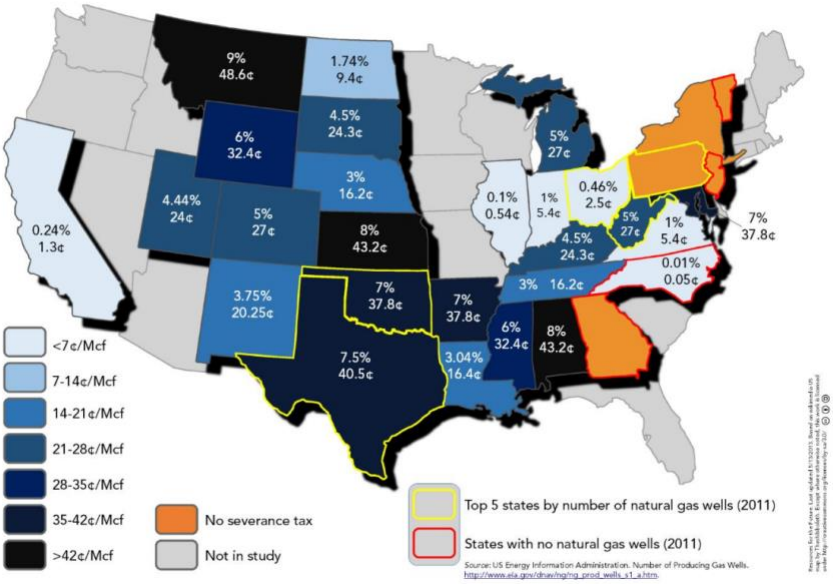

Figure 7: Severance taxes at $5.40/Mcf gas price (Krupnick and Richardson 2013).

Transportation sector policies

There are a variety of policies that affect energy use and emissions in the transportation sector, some intentionally (e.g., federal GHG standards for vehicles) and others incidentally (e.g., the federal gas tax). Some focus on fuels, others on vehicles, and still others target infrastructure. All these policies affect the type and volume of fuels being consumed in the region (and therefore CO_2 emissions), and therefore also the types of infrastructure developed to serve demand--some of which is shared with other sectors, such as industrial and commercial operations. The following section organizes transportation policies into four categories: vehicle standards, vehicle purchase incentives, fuel standards and subsidies, and vehicle fueling infrastructure (including electric vehicle charging).

Vehicle standards

Following the Supreme Court ruling in *Massachusetts vs EPA,* it was determined that the Clean Air Act (CAA) requires the U.S. Environmental Protection Agency (EPA) to regulate greenhouse gas (GHG) emissions from transportation ("mobile sources"). This has led to standards for both light-duty vehicles (LDV) and medium and heavy-duty vehicles (MHDV). Federal LDV GHG emissions standards are combined with the Corporate Average Fuel Economy (CAFE) standards established by the Energy Policy and Conservation Act of 1975 and administered by the National Highway Traffic Safety Administration (NHTSA). Similar standards have more recently been established for MHDVs. These standards have driven a gradual improvement in the fuel efficiency and carbon intensity of vehicles.

In addition to requiring EPA to promulgate national standards for vehicles, the CAA authorizes California to seek a waiver from federal preemption (otherwise established in the CAA) over state standards—which effectively allows California to set its own standards, as long as they are at least as stringent as federal standards. Furthermore, Section 177 of the CAA allows other states to adopt California's standards instead of the federal standards. In 2012, the California Air Resources Board adopted its Advanced Clean Cars Program (ACCP), which established light-duty vehicle emissions standards (pursuant to the CAA waiver) for model years 2015-2025. In addition to emissions standards, the ACCP established a zero-emissions vehicle (ZEV) mandate—requiring that a certain percentage of new light-duty vehicle sales be electric vehicles (EVs), hydrogen fuel vehicles or plug-in hybrid vehicles.[67] At the time of drafting this report, Colorado has joined this program, and New Mexico is in

[67] https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program/about

the process of joining.[68] California is now working on a second regulation—Advanced Clean Cars 2, which will set more stringent targets for model years 2026-2035.

Additionally, in 2021 California adopted a similar program for medium- and heavy-duty vehicles, called Advanced Clean Trucks (ACT), which sets ZEV targets for manufacturers of Class 2b-8 vehicles.[69] Similar to the ACCP, other states can choose to adopt the California standards. Furthermore, the ACT is intended to be paired with a policy still under development at the time of writing called Advanced Clean Fleets (ACF), which would regulate fleet owners with the goal of achieving the ACT targets.[70] At the time of writing, none of the Intermountain West states have adopted the ACT rules to our knowledge.

Vehicle purchase incentives

In addition to mandates like the ACCP ZEV program, there are a number of federal and state market mechanisms designed to incentivize the adoption of low-carbon vehicles. At the federal level, the Internal Revenue Code Section 30D[71] tax credit (maximum of $7,500 pr vehicle) for electric passenger vehicles and the 30B[72] tax credit for "alternative motor vehicles" (includes hydrogen and compressed natural gas (CNG) vehicles) are examples of federal tax policy designed to incentivize the adoption of clean fuel vehicles.

There are a variety of similar policies in effect within the region. These policies range from tax credits, exemptions, and deductions, to grants and loans. Arizona also incentivizes alternative fuel vehicles (AFVs) by allowing them to drive in HOV lanes regardless of the number of occupants, and by allowing them to park for free in spaces designated for carpool operators.

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[68] https://ww2.arb.ca.gov/resources/documents/states-have-adopted-californias-vehicle-standards-under-section-177-federal; https://www.edf.org/media/epa-moves-restore-states-unlawfully-withdrawn-ability-set-clean-car-standards

[69] By 2035, ZEV sales would need to be 55% of Class 2b – 3 truck sales, 75% of Class 4 – 8 straight truck sales, and 40% of truck tractor sales. For more detail, see: https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-trucks-fact-sheet

[70] https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-fleets-regulation-summary

[71] https://uscode.house.gov/view.xhtml?hl=false&edition=prelim&req=granuleid%3AUSC-prelim-title26-section30D&num=0&saved=%7CKHRpdGxlOjI2IHNlY3Rpb246MzBDIGVkaXRpb246cHJlbGltKQ%3D%3D%7C%7C%7C0%7Cfalse%7Cprelim

[72] https://uscode.house.gov/view.xhtml?hl=false&edition=prelim&req=granuleid%3AUSC-prelim-title26-section30B&num=0&saved=%7CKHRpdGxlOjI2IHNlY3Rpb246MzBDIGVkaXRpb246cHJlbGltKQ%3D%3D%7C%7C%7C0%7Cfalse%7Cprelim

Table 19. Vehicle purchase incentives by state	
State	**Policy summary**
Arizona	- Reduced vehicle license tax for an alternative fuel vehicle (AFV) - Use tax exemption for vehicles converted from diesel to alternative fuels - HOV lane and free parking incentives
Colorado	- Income tax credit for the purchase or lease of LDV and MHDV EVs, plug-in hybrid electric vehicles (PHEVs), and AFVs - Grants to scrap & replace pre-2009 MHDVs, with EVs or renewable natural gas vehicles - Grants for local government to purchase electric vehicles
Montana	- Grants for MHDV electric and alternative fuel transit buses - Income tax credit for converting conventional fuel vehicles to use alternative fuels
New Mexico	- Grants for converting MHDVs to run on alternative fuels, and for new electric MHDVs - Revolving loan fund for local government AFV purchases
Utah	- Income tax credit for the purchase of AFV MHDVs - Grants for businesses to convert conventional fuel vehicles to AFVs
Wyoming	N/A

Source: North Carolina Clean Energy Technology Center, 2021

Fuel standards and subsidies

The federal Renewable Fuel Standard (RFS),[73] established by the Energy Policy Act of 2005 (which amended the Clean Air Act to include the RFS[74]) and later modified by the Energy Independence and Security Act of 2007, is an example of a regulatory policy aimed not at vehicles but at increased adoption of low carbon fuels, such as biodiesel and ethanol. The RFS requires fuel blenders to

[73] See 40 CFR Subpart M

[74] See 42 U.S. Code § 7545(o)

incorporate a certain amount (determined annually by EPA as the Renewable Volume Obligation or RVO) of renewable fuels[75] into their petroleum-based gasoline and diesel products, with a goal of incorporating 36 billion gallons of total renewable fuels by 2022.[76] Compliance is demonstrated by how many renewable fuel credits (referred to as Renewable Identification Numbers or RINs) a given firm acquires in a given year. Firms can acquire RINs when they purchase fuels, or they can purchase RINs directly in a credit market.

The federal government also utilizes the tax code to incentivize a shift to low carbon fuels. For example, a biodiesel tax credit of $1.00 per gallon may be claimed by fuel blenders for adding biodiesel or renewable diesel to diesel fuel, including heating oil.

Three states (Bracmort, 2021) in the nation have programs similar to the RFS: the California Low Carbon Fuel Standard, the Oregon Clean Fuels Program, and the Washington Clean Fuel Standard.[77] All of these policies mandate increased adoption of low carbon fuels. While Colorado and New Mexico have both considered similar policies,[78] at the time of writing none of the Intermountain West states have implemented such a policy. Nonetheless, the federal policies as well as the west coast state policies all together create a demand for biofuel production in the region, even if some of that production is consumed elsewhere.

Vehicle fueling infrastructure

The federal 30C[79] Alternative Fuel Vehicle Refueling Property Credit provides a tax credit up to 30 percent of the cost of certain fueling infrastructure associated with low-carbon transportation, including EV charging stations, as well as hydrogen and CNG fueling stations.

The federal government also advances clean transportation infrastructure through the distribution of funds via grants and by directing funds to states. For example, the Bipartisan Infrastructure Law, which passed in late 2021, directs $7.5 billion to projects aimed at EV charging infrastructure expansion. Another $5 billion goes directly to states through formula funding, and the remaining $2.5 billion is

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[75] The RFS defines renewable fuels as: biomass-based diesel, cellulosic biofuel, advanced biofuel, and total renewable fuel.

[76] https://www.epa.gov/renewable-fuel-standard-program/overview-renewable-fuel-standard

[77] https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard, https://www.oregon.gov/deq/ghgp/cfp/Pages/default.aspx, https://ecology.wa.gov/Air-Climate/Climate-change/Reducing-greenhouse-gases/Clean-Fuel-Standard

[78] https://drive.google.com/file/d/11zczj8ieUzNbxMvlob9HJCctyzJGVYF3/view; https://www.nmlegis.gov/Sessions/21%20Regular/bills/senate/SB0011.pdf

[79] https://uscode.house.gov/view.xhtml?req=(title:26%20section:30C%20edition:prelim)

allocated to competitive grants.[80] In addition, long-standing policies such as the Federal-Aid Highways Program (FAHP) and the Federal Public Transportation Program (FPTP) have directed federal dollars to transportation projects, some of which could play a role in decarbonizing transportation. For example, in addition to generally supporting public transportation (an important strategy for reducing vehicle-miles traveled), the FPTP includes the Low or No Emission Vehicle Program, which provides funds (roughly $1 billion annually) through competitive grantmaking for the purchase of facilities that service low-emissions vehicles, such as electric vehicle charging stations (Mallett, 2022). And, while the FAHP largely funds the construction of highways, it also includes a program focused on reducing emissions from transportation—the Congestion Mitigation and Air Quality Improvement Program, which was allocated an average of $2.4 billion annually in recent years (Kirk, 2021).

The Intermountain West states are all part of REV West, a consortium of eight states (including the six encompassed in I-WEST, plus Idaho and Nevada) working to develop an "Intermountain West EV Corridor," including coordination on the siting of EV charging stations, fundraising, establishing voluntary minimum standards for charging stations and more.[81]

In addition, as indicated in Table 20, several of the Intermountain West states have individual policies to promote the development of EV charging and AFV fueling infrastructure, in addition to incentives and other programs offered by electric utilities.

Table 20. EV and AFV infrastructure incentives by state

State	Policies
Arizona	N/A
Colorado	- Grants for fueling and charging infrastructure - Natural gas fueling station air quality permit exemption - Technical assistance / coaching on EV infrastructure development
Montana	N/A
New Mexico	- Grants for fueling and charging infrastructure
Utah	- Grants for EV charging infrastructure
Wyoming	N/A

Source: DSIRE

[80] https://www.whitehouse.gov/briefing-room/statements-releases/2021/12/13/fact-sheet-the-biden-harris-electric-vehicle-charging-action-plan/

[81] https://www.naseo.org/issues/transportation/rev-west

Future policy

In this section, we move our focus towards future policy needs and away from describing the current policy landscape. We present some ways of framing the topic first and then present a set of bullets describing future policy options by topic area. In this effort, we have drawn on—most importantly—topics, ideas and recommendations coming out of the I-WEST Policy Workshop, as well as interviews we conducted, reports we read, including state roadmaps, workshops held by others on the I-WEST team, and our own expertise as economists and policy analysts.

Framing future policy needs

There are two basic ways of thinking about future policies: (i) as a roadmap and (ii) as a menu. For the former, a set of policies is presented as an integrated whole with tradeoffs and potential inconsistencies among them already worked out. A menu approach, in contrast, presents a range of policies, making no claims of consistency or choosing the best policy combinations given the tradeoffs. Described in this way, (ii) is a preliminary step towards the desired goal for a roadmap. In this report, we "walk before we run" and take the approach of (ii).

In this spirit, there are several themes that underlie policy choices:

States start from very different places on energy and climate policies, so some have farther to go than others.

Each state has its own unique history of fossil fuel development and laws supporting and shaping that development. The degree of tribal, state, and local revenue dependence on this sector is one important outcome that is shaped in part by policy at all levels of government. Likewise, each state government projects a unique attitude towards climate change and policies to support the transition away from fossil fuels. These attitudes are manifest, for instance, in creation of transition roadmaps by some states. Populations have attitudes that, in some states, predominantly small government and tout that they are "open for business," while other states favor a larger government role and seek to significantly shape industry behavior.

Policies addressing sectors, technologies, and fuels will be needed. Take advantage of federal policies; leverage federal and non-regional governments; find industry first movers.

Irrespective of a state's history, attitudes, political orientation, and existing policy landscape, policies covering the major sectors (transportation, residential/commercial buildings, hard to decarbonize industry, the fossil fuel sectors), addressing cross-sectoral technologies (such as CCUS) and key "new" fuels (such as blue/green hydrogen and biofuels) will be needed to speed the transition and make it

cost-effective. Fossil fuel dependent states and tribes may naturally turn to policies favoring blue hydrogen and CCUS more generally, because these approaches permit a thriving natural gas sector. States and tribes with a high degree of dependence on oil extraction may focus on reducing upstream emissions (e.g., methane) from extraction and pursuing net-zero carbon oil through the combination of direct air capture and enhanced oil recovery.

Of course, when considering future policies, states and tribes are not on their own. They may have considerable help from voluntary actions by the private sector, public-private partnerships, and the federal government. Private sector leadership, pushed by their employees, stockholders, lenders, and rating agencies, is increasingly setting ambitious GHG reduction targets, developing company and Association-level decarbonization roadmaps, and planning (and in some cases already building) major decarbonization projects. In the region, some 60 projects are listed in this category. Granted, some of these projects have also been pushed by state and federal financial help (see below). In any event, states would do well to partner with industry leaders across a variety of dimensions, including public-private partnerships on pilot projects and policies to encourage voluntary behavior (e.g., favorable tax treatment, zoning exceptions, and expedited permitting).

Considering the federal aid, there are a raft of policy carrots and sticks administered by the federal government that have been detailed in the policy landscape section of this chapter. The leveraging we have in mind could take several forms, including getting more federal risk bearing guarantees for modular nuclear power plants and CO_2 leakage liabilities from storage wells, as well as helping to enforce and build upon federal regulatory programs, such as the proposed methane rule for existing oil and gas wells.

As for leveraging state government policies, some of the fossil fuel-dependent Intermountain West states and tribes are major exporters of this energy, such as to the West Coast. Given that some of the greatest market opportunities for clean energy generated in Intermountain West states exist in CA, OR, and WA (where strong decarbonization policies do exist, such as renewable portfolio standards and low carbon fuel standards), special attention should be placed on policies and infrastructure development efforts that maximize access to those markets (such as high voltage transmission lines that connect wind resources from Wyoming and Montana, for example, to the Pacific state markets).

Work together to (i) harmonize policies, including those on infrastructure (grid);(ii) be competitive for federal demonstration project funding, (iii) build interdependent roadmaps.

While Intermountain West states and tribes often go their own way on many policy issues, they already work together on many issues, but will have to raise these activities to a new level if the region is to cost-effectively decarbonize. Policy harmonization is needed on regulations for hydrogen and CO_2 pipelines that cross state or tribal borders, for instance. Most important is to end the balkanization of

the electric grid, this region along with the southeastern US being the only regions not served by an independent system operator or regional transmission organization. Such operators could lead region-wide planning for smart grids and new transmission lines and help in load balancing as more generation relies on intermittent renewables. Another important concern is economic "leakage" of emissions. Unless states cooperate, tight regulations in one state could end up being offset by industry relocation to other states or by other activities that move geographically to take advantage of cost and regulatory differentials.

We envision a more short-term cooperation among states as well, recognizing that in competing for major federal grant money under the new Infrastructure legislation and earlier legislative initiatives, multi-state proposals that take advantage of each state's comparative advantage will be more competitive than one state going it alone. Already, in response to the $8 billion being made available for hydrogen hub demonstration projects, Wyoming, Colorado, Utah, and Montana have signed an MOU to submit a joint proposal to help secure a hydrogen hub for the region termed WISHH (Western Inter-States Hydrogen Hub).

Ultimately, just as states need to plan their own decarbonizing strategies—as Colorado and New Mexico have done with their roadmaps—the Intermountain West states need to build roadmaps that reflect and address their interdependencies in decarbonizing.

Native nations in the Intermountain West face a distinct set of challenges and opportunities, with wide variation across tribes.

Tribes have experienced many injustices at the hands of the federal government over two centuries, including energy and environmental injustices for tribes in the region. These include health impacts associated with coal and uranium mining, mismanagement of energy leases on tribal trust lands, and a lack of access to modern energy services. For an energy transition to be successful, federal and state officials will need to work closely with their tribal partners, treat them as equals, and seek to address the injustices of the past.

Some tribes, such as the Navajo, Hopi, and Crow, have already experienced substantial economic disruptions due to the downturn of coal mining and coal-fired power generation. These tribes are taking different approaches to the energy transition, in some cases working closely with the federal government to speed the deployment of renewable energy—solar in particular.

However, numerous barriers exist to developing clean energy on and around reservation land. This includes (1) bureaucratic challenges associated with working with multiple federal agencies that slows permitting processes; (2) difficulty accessing federal tax credits for clean energy, CCUS, and other projects; and (3) limited access to existing energy infrastructure (e.g., transmission lines).

Some tribes in region depend heavily on oil and gas production as an economic engine. These include the Southern Ute Indian Tribe, Jicarilla-Apache, Ute Indian Tribe of the Uintah & Ouray Reservation, and the Eastern Shoshone and Northern Arapaho Tribe of the Wind River reservation. These tribes will face important questions about the role that oil and gas production will play in their energy futures. Some, such as the Southern Ute Indian Tribe, are taking innovative approaches to deploying new zero-emissions technologies that can help play an important role in the energy transition.

Community attitudes to transition could determine success, so engagement and tailoring policy interventions to state and local policy conditions are important.

Federal or state efforts to support an energy transition will only be successful if they work closely with community partners and leverage local strengths. Consistent communication between federal, state, and local partners will be essential, and will need to flow in multiple directions, so that federal and state priorities can match local needs and "on the ground" experience.

Developing these relationships will take time and require resources. In some Intermountain West communities, there is a strong local culture of independence and skepticism of federal government interventions. Federal and state policymakers should seek to engage local stakeholders early and often to build trust and incorporate local perspectives to address potential barriers.

Community issues have the potential to accelerate or impede the energy transition. Benefits will include new employment opportunities, tax revenue, and potentially reduced local pollution. But concerns will also arise from siting new infrastructure (e.g., pipelines, CCUS facilities, electricity infrastructure). Policymakers at all levels will need to understand and address these concerns as they arise.

A transition away from fossil fuels could be very disruptive for some communities, particularly those with a heavy reliance on coal, oil, and natural gas activities for local employment and tax revenue. Policymakers will likely need to allocate resources to support workers and communities in transition.

Specific policy options

In this section are some of the policy ideas to support regional decarbonization that have surfaced in our Policy Workshop and other research, including short- to long-term implementation possibilities, organized by topic area. Some Intermountain West states may serve as examples for some policies, but in cases where none of the states have implemented the policy we denote it with "*".

Cross-cutting

- Develop private/public partnerships to speed private sector innovation (such as expedited permitting), with Colorado as an example

- Seek primacy over Class VI wells, with Wyoming as an example
- Develop new initiatives for the states to engage with local energy communities and begin the process of preparing these communities for the energy transition, such as the establishment of a Just Transition Advisory Council and Just Transition Office in Colorado
- Ensure adequate monitoring, reporting, and verification for all relevant climate policies such as biofuels, offsets, and other relevant applications*
- All states need a decarbonization roadmap and it should contain elements of cross-state cooperation, with New Mexico as an example
- Price carbon and use the revenues to support low-income households and transition efforts or develop and implement CO_2 tradable performance standards for industry and electricity sectors*

Tribes

- Allow for "direct pay" of clean energy tax credits (e.g., PTC, ITC, 45Q), which are currently not available to Native American businesses and individuals*
- Streamline permitting and siting processes for CO_2 and hydrogen pipelines and electricity transmission (for states and federal government), including on Native American reservations (for federal government)*

Electricity

- Building on the Western Energy Imbalance Market, take further steps to integrate wholesale electricity markets, either through the establishment of a regional independent system operator or other measures*
- Build better access to western electricity and fuel markets for Intermountain West energy sales*
- Accelerate the deployment of renewable and other zero-carbon electricity sources through policies such as clean energy standards or other mechanisms

Industry

- Convene industrial stakeholders to establish state industrial decarbonization roadmaps tailored to each state's unique industrial economy and future development potential, with attention to opportunities for interstate collaboration and for advancing circular economies that capture industrial waste products such as waste heat
- Expand and establish state incentives, such as tax credits, to support investments in industrial decarbonization technologies and systems*

- Establish state procurement policies that prioritize low-carbon options for historically emissions-intensive products, such as steel and cement (similar to Buy Clean policies implemented in California[82] and Washington[83] and that will be implemented by the Biden Administration)*
- Leverage federal technical assistance programs such as those provided by the DOE Advanced Manufacturing Office, and provide additional on-the-ground technical assistance to industrial firms in the development of innovative plans for decarbonization and also to access the capital to implement such plans, including federal grant and loan money.* The passage of the IRA has vastly expanded the pool of funds available.
- States should work together to reduce the risks that CO_2 reductions in Intermountain West states could be offset by increases elsewhere through the relocation of industrial or other emissions sources*

Fuels

- Develop a competitive multistate hydrogen hub proposal and follow through if it wins
- Assuming federal methane regulations are implemented, support its implementation, and help companies comply; if it is held up, consider adopting LDAR programs, as in Colorado and New Mexico
- Reform state financial assurance requirements to reduce the risk of a large proliferation of orphaned oil and gas wells; this means raising bonding requirements to be more in line with expected capping and land restoration costs*

Transportation

- Study and develop policies to address social equity issues regarding access to low-carbon transportation options like electric vehicles
- Adopt policies that set zero-emissions vehicle (ZEV) sales targets for light-duty vehicles, perhaps under the auspices of the California Advanced Clean Cars 2 regulations
- Address medium- and heavy-duty vehicle emissions through the adoption of the California Advanced Clean Trucks and Advanced Clean Fleets regulations, or similar policies (proposed by Colorado)
- Establish state purchase incentives for consumers to subsidize the cost of new *and* used zero-emission light-, medium-, and heavy-duty vehicles, including rebates for ZEVs and fees for fossil fuel combustion vehicles, and with higher rebates for low-income families (in the light-duty market)

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[82] https://www.dgs.ca.gov/PD/Resources/Page-Content/Procurement-Division-Resources-List-Folder/Buy-Clean-California-Act

[83] https://lawfilesext.leg.wa.gov/biennium/2021-22/Pdf/Bills/House%20Bills/1103.pdf?q=20220517114405

- Access federal dollars (including formula funds being made available through the National Electric Vehicle Infrastructure program) to support the development of electric vehicle charging infrastructure
- Establish low carbon fuel standards that prioritize the use of second-generation biofuels (such as those that use woody biomass as fuel feedstocks, providing a market-based engine for forest management and climate resilience, while producing low-carbon fuels as is being discussed for implementation in New Mexico)
- Bolster interstate coordination of key infrastructure development for low-carbon transportation, such as to the REV West program
- Invest more in urban public transit and support transportation and land-use planning that minimizes vehicle miles traveled (VMT) in personal vehicles
- Conduct a multi-state study on the potential to replace state fuel taxes with a mileage-based user fee
- Apply state green procurement programs for cement, steel and other embodied materials to road and bridge projects funded by Federal Highway Trust Fund support

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