Planning an Inclusive Indigenous Energy Transition

Lessons from Tribal Federal Policy and Energy Development to Date

by

Sade Kailani Nabahe

Bachelor of Science in Mechanical Engineering
Massachusetts Institute of Technology (2017)

Submitted to the Institute for Data, Systems, and Society
in Partial Fulfillment of the Requirements for the Degree of

Master of Science in Technology and Policy

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

June 2021

Signature of Author.....
Institute for Data, Systems, and Society
May 14, 2021

Certified by .....
Michael J. Kearney
Executive Director, The Roosevelt Project
Thesis Supervisor

Accepted by .....
Noelle E. Selin
Director, Technology and Policy Program
Associate Professor, Institute for Data, Systems,
and Society and department of Earth, Atmospheric, and Planetary Science

Planning an Inclusive Indigenous Energy Transition

Lessons from Tribal Federal Policy and Energy Development to Date

by

Sade Kailani Nabahe

Submitted to the Institute for Data, Systems, and Society
on May 14, 2021 in Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Technology and Policy

ABSTRACT

In 2019, Governor Michelle Lujan Grisham announced the New Mexico's dedication to combating climate change and passed the Energy Transition Act (ETA). The ETA calls for 50% of New Mexico's electricity to be generated from renewable energy resources by 2030, 80% by 2040, and 100% carbon free by 2045 - dramatically affecting how New Mexico gets its energy. These effects will impact some regions and populations more than others. And these issues are not unique to New Mexico.

Indigenous people will be particularly affected due to a long-term reliance on fossil fuels. Since 2003, fossil fuels have provided tribes with over $11.4 billion in royalties, which are used to maintain public infrastructure, run schools, and provide community services. For some tribes, royalties support most tribal operations. For instance, coal royalties supplied 50 percent of the Crow Indian reservation's funds and oil royalties provided 90 percent of the Three Affiliated Tribes' revenue. To mitigate impacts, tribes can tap into renewable energy resources on their land. However, current federal policies, processes, and services prevent tribes from doing so.

The goal of this body of work is to inform federal and state leaders how current policies will negatively impact indigenous peoples and perpetuate energy injustice. The paper also looks at how these issues play out in real time in New Mexico, a state that has tremendous renewable energy potential and a large indigenous presence, but will grapple with a long history with coal, oil, and natural gas. Lessons learned are drawn from tribal federal policies and tribal energy development experience. In the end, the paper develops policy recommendations, in the hopes of creating a more inclusive, equitable indigenous energy future.

Thesis supervisor: Michael J. Kearney
Title: Executive Director, The Roosevelt Project

Acknowledgements

I would like to acknowledge the following people who have been so supportive during my time in the Technology and Policy Program:

I would like to first thank Michael Kearney, executive director of the Roosevelt Project and thesis supervisor, who has supported and supervised my research for the past two years.

I also would like to give a huge thanks to David Foster, a MIT visiting scholar and member of the Roosevelt Project, for his incredible mentorship and training on energy workforce issues.

I would like to thank the strong network of women that care and inspire me daily, both professionally and personally.

A big thanks to the Chwe family for providing a safe and loving refuge while I wrote this entire thesis (and bunkered the worst of COVID-19).

And finally, I would like to thank my family, who continually ground and remind me of where I come from. Without their incredible support, I would not be where I am today.

Table of Contents

List of Figures

List of Tables

List of Abbreviations

American Indian and Alaska Native (AIAN)
Assistance to Coal Communities (ACC)
Bureau of Indian Affairs (BIA)
Bureau of Land Management (BLM)
Bureau of Trust Funds Administration (BTFA)
Carbon capture, utilization, and storage (CCUS)
Central New Mexico Community College (CNM)
Combined heat and power (CHP)
Comprehensive Service Program (CSP)
Department of Agriculture (USDA)
Department of Energy (DOE)
Department of Housing and Urban Development (HUD)
Department of the Interior (DOI)
Economic Adjustment Assistance (EAA)
Economic Development Administration (EDA)
Electric power generation (EPG)
Energy efficiency (EE)
Energy Information Administration (EIA)
Energy Transition Act (ETA)
Federal Aviation Administration (FAA)
Federal Communications Commission (FCC)
Federal Emergency Management Agency (FEMA)
Fiscal year (FY)
Government Accountability Office (GAO)
Heating, ventilation, and air conditioning (HVAC)
Indian Energy Service Center (IESC)
Indian Tribal Energy Development and Self Determination Act (ITEDSA)
Information technology (IT)
Memorandum of understanding (MOU)
National Congress of American Indians (NCAI)
National Historic Preservation Act (NHPA)
National Oceanic and Atmospheric Administration (NOAA)
Northern Rio Arriba Electric Cooperative (NORA)
Office of Natural Resources Revenue (ONRR)
Office of Personnel Management (OPM)
Photovoltaic (PV)
Power purchase agreement (PPA)
Public Service Company of New Mexico (PNM)
Request for proposal (RFP)
San Juan Generating Station (SJGS)
Tohono O'odham Utility Authority (TOUA)
Transmission, distribution and storage (TDS)
Tribal Energy Program (TEP)
Tribal Energy Development Capacity (TEDC)
Tribal Energy Resource Agreements (TERAs)
Tribal Utility Authority (TUA)
United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP)
US Energy and Employment Report (USEER)
Workforce Innovation and Opportunity Act (WIOA)

Units

1 Megawatt (MW) = 1,000 Kilowatt (kW)
Barrel of Oil (Bbl) = 42 gallons of oil
One thousand cubic feet (mcf)

Planning an Inclusive Indigenous Energy Transition

Lessons from Tribal Federal Policy and Energy Development to Date

Chapter 1: Introduction

In November 1998, a Native Peoples Climate Change Workshop was held in Albuquerque, New Mexico. There in a Circle of Wisdom, it was said, "the Creator has entrusted us a sacred responsibility to protect and care for the land and all of life, as well as to safeguard its wellbeing for future generations to come" (*Environmental Justice Leadership Is Non-Negotiable — Tishman Environment and Design Center*, n.d.)." Over 20 years later, this call to action could not be more urgent.

Recent legislation like the New Mexico Energy Transition Act (ETA) aims to reduce greenhouse gas emissions and provide a path towards a just transition. The ETA also provides supplemental relief funding for affected workers and local communities. However, the ETA has been criticized for failing to prioritize the voices of indigenous communities and workers who are most affected by the energy transition (Tewa Women United, 2019).

This is especially problematic because indigenous people will be one of the groups that will be negatively impacted by a transition. Since 2003, coal, oil, and gas have provided tribes with over $11.4 billion in royalties (Department of the Interior, n.d.). These funds that are used to maintain public infrastructure, run schools, and provide community services. While some tribes have not engaged with the fossil fuel industry, some tribes are dependent on royalties for tribal government revenue. For example, coal royalties supplied 50 percent of the Crow Indian reservation's funds and the Chairman Mark Fox of the Three Affiliated Tribes estimates that 90 percent of revenue is supplied from oil alone (Regan, 2013) (Estus, 2020).

The extent to which indigenous people are impacted can be reduced with federal policy reform even though it has long restricted how tribes can use their land. It also gives leaders the chance to repair egregious actions of the past. And more importantly, decarbonization of our energy system give policymakers, indigenous communities, and workers the ability to reinvent how we produce, deliver, and regulate energy (Baker, 2021). Department of Energy (DOE) Deputy Director of Energy Justice and Secretary's Advisor on Equity, Shalanda Baker, states, "our disagreements, however, lie in how much we will change the system" (Baker, Shalanda 2021, pg. 8). I argue that the current energy policies and processes are not well prepared to support indigenous communities and workers. I demonstrate this by conducting two streams of analysis: 1) an evaluation of federal tribal legislation and 2) an investigation of the ongoing transition in New Mexico. In highlighting the avoidable challenges that indigenous communities will face, I aim to offer solutions to policymakers on how to plan for a transition that prioritizes indigenous communities.

Energy Justice Framework

For the purposes of this paper, it is important for the reader to be familiar with the four pillars of energy justice. In Revolutionary Power, Shalanda Baker defines the four parts of energy justice to be distributional justice, recognitional justice, procedural justice, and restorative justice (Baker, 2021).

Distributional justice focuses on the distribution of opportunities, goods, and services. This includes but is not limited to: access to water, air, food, electricity, and information. Extensive literature points to examples of the lack of electricity, clean air, clean water, and food within tribal communities. These are important issues and continue to be areas that need to be addressed with indigenous communities. Yet, for the purpose of my analysis, I focus on the inequities that indigenous people face as it relates to the energy system. Some distributional justice issues I highlight in this paper are information access, insufficient data collection, problematic legislation that restricts how tribes use their designated land, and inadequate federal funding.

Recognitional justice acknowledges and respects different populations and their needs. Recognitional justice promotes respect for a group's culture, history, and voices. This pillar aligns with the UN Declaration on the Rights of Indigenous Peoples (UNDRIP) that demands free, prior, and informed consent in projects, policies, or investments that may impact indigenous people, whether positively or negatively (*FPIC-UNDRIP*, n.d.). While this is closely related with procedural justice, the third pillar, it also falls under recognitional equity because any engagements that do not offer free, nor prior, nor informed consent, are disrespectful and therefore, unjust.

Procedural justice focuses on ensuring stakeholder participation in the decision-making process. Procedural justice is defined as continuous equitable participation in project development, in governance, and in outreach to marginalized groups. Procedural justice is more than an open comment period and other community engagement processes which are often treated as checkboxes instead of respectful and right things to do. Promoting equitable participation does not simply end at increased advertising or marketing initiatives. It requires decision makers to meet their constituents where they are, both physically and culturally.

And finally, restorative justice addresses the past harms that frontline communities have faced in history and the energy sector. Indigenous people across the country have endured unimaginable hardships since colonization. Therefore, leaders and policymakers have a moral obligation to address distributional, recognitional, procedural, and restorative injustices. In this paper, I propose recommendations for how leaders can take actions that make up for this long destructive history.

Background Terminology

Language around the indigenous experience in the US is complicated. Therefore, I make choices on how I use terms throughout the paper that refer to indigenous people and their experience. In general, indigenous people prefer to be recognized by the name of their tribe. When referring to individuals across tribes, I use *indigenous.* However, throughout the paper, I use different terms for different reasons. *American Indian* is the racial category for indigenous people in the United States. While American Indian is not a preferred term to describe indigenous people, the Census and Department of Labor use it to categorize Americans by race, so I use it when discussing any demographic data. Similarly, I use the term *Native American* when referencing events discussed in history and referencing legislative materials. I will also refer to land owned by a federally recognized tribe as *tribal land*. See Figure 1 for a map of all federally recognized tribal land in the United States. Throughout the paper I use the term *tribal sovereignty* which refers to the "right of American Indians and Alaska Natives to govern themselves" (*An Issue of Sovereignty*, n.d.). And finally, *energy sovereignty* refers to energy independence that numerous tribes are driving towards.

Furthermore, it is important to distinguish between equity and justice, which are terms used throughout this body of work. Kumar describes equity as "giv[ing] people what they need, to enjoy healthy lives" whereas justice is "the collective responsibility of a free and just society, to ensure that civil and human rights are preserved and protected for each individual regardless of gender, race, ethnicity, nation of origin, sexual orientation, class, physical or mental ability, and age" (Kumar, 2017).

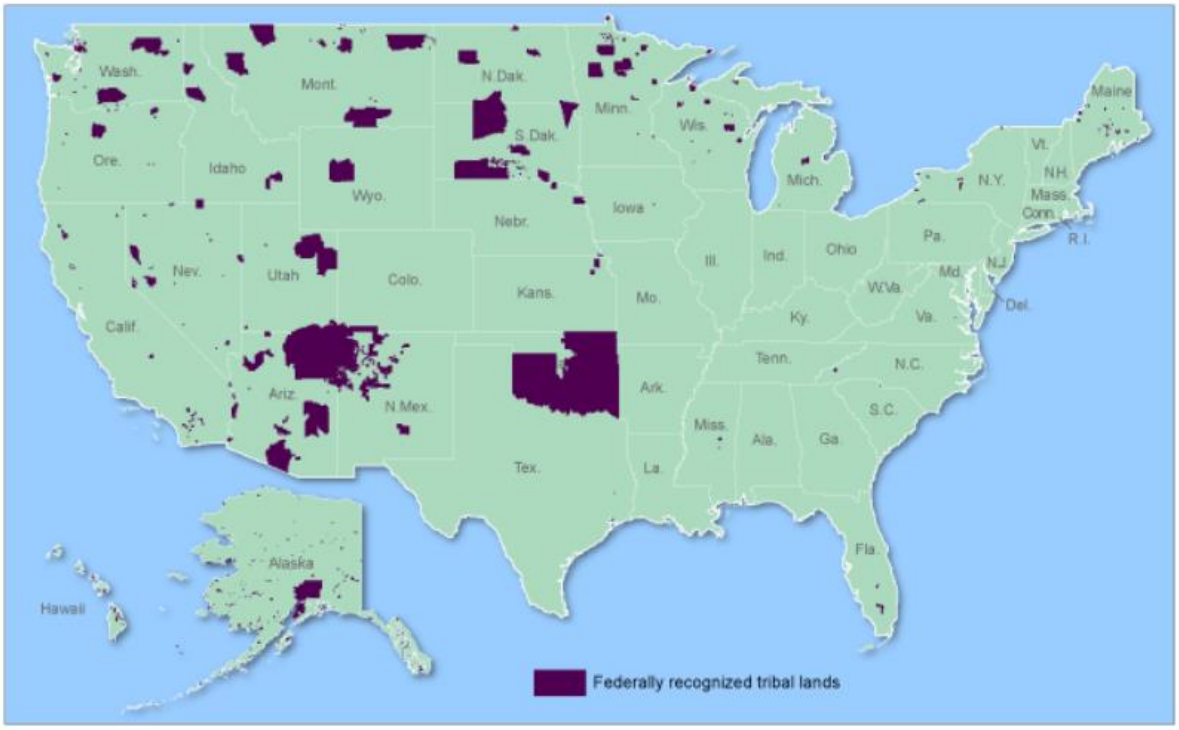

Figure 1: Federally Recognized Tribal Land (Office of U. S. Government Accountability, 2019)

Paper Structure

As for the paper's methodology, I follow Jenkins et al's (2017) approach to highlight where inequities emerge through federal policy, real-life case studies, and excerpts from tribal leaders. I focus injustices around the current energy landscape, policy context, tribal history, and information exchange.

I structure this body of work in three main sections. In Chapter 2, I provide a brief overview of tribal energy development history. Here I speak about the role of fossil fuels in indigenous communities and the significant potential for renewable energy. Then I describe the status of the indigenous energy workforce and how the federal government consults tribes. This leads me to highlight transitional challenges for indigenous communities and outline my proposed federal recommendations.

In Chapter 3, I consider how an energy transition will impact 23 tribes and pueblos in New Mexico - a state that has tremendous renewable energy potential, but a long history with coal, oil, and natural gas. I also discuss what renewable energy activities have taken place on tribal land. Then I identify potential workforce

challenges that New Mexico tribes will face and explore how energy independence can be promoted. Similarly, this leads me to highlight additional state level policy recommendations.

Chapter 4 compiles all recommendations I identify in Chapter 2 and 3. These recommendations give policymakers and community leaders actionable takeaways that are needed for an equitable indigenous energy transition. Chapter 5 offers conclusions and options for future work.

Chapter 2: US Tribal and Energy Landscape

2.1 US Tribal and Energy Landscape

Mineral resources and energy development are quite intertwined with the economic progress that indigenous tribes have achieved. In this section, I give a brief description of the fossil fuel production and generated revenue on tribal lands to illustrate what a transition means for the financial stability of some tribes moving forward. Then, I scan current tribal renewable energy development in the United States and highlight current failures with federal programs. This leads me to a discussion around the increasing federal support for tribal clean energy deployment and the formation of tribal utility authorities. Throughout Chapter 2, I highlight inequities present in the energy system that I will use to guide my recommendations.

2.11 Tribal Fossil Fuel Landscape

Coal

Tribal nations are estimated to hold access to almost a third of the nation's coal resources. The Department of the Interior estimates that 25 federally recognized tribes have access to coal resources (*Coal and Native American Tribal Lands*, 2021). Tribes like the Navajo Nation, Crow Indian Reservation, and Southern Ute rely heavily on their production to provide economic opportunities for their communities and jobs for their tribal members. In 2020, coal provided $28 million in royalties to tribes (Department of the Interior, n.d.). These are funds that are used to maintain public infrastructure, run schools, and provide community services. The extent to which some tribes rely on coal can be quite significant. For example, coal royalties supplied 50 percent of the Crow Indian reservation's funds (Regan, 2013). Similarly, coal royalties and taxes contributed 80 percent of the Hopi's general budget and 60 percent of the Navajo general fund (*Coal and Native American Tribal Lands*, 2021). This has caused tribes economic concerns as production of coal on tribal nations has declined in the past ten years with the introduction of natural gas.

As for the story of production, coal production increased between 2003 to 2005 and peaked at 34.1 million tons in 2005. Since then, production has decreased over the past 15 years. In 2020, 6.4 million tons were produced on tribal lands (Department of the Interior, n.d.). While production decreased, coal royalties did not follow this trend. As Figure 3 shows, tribes received a large $125 million increase in royalties in 2004. From 2005 to 2019, royalties fluctuated between $60 million and $80 million. This is quite different than the rest of the US which saw royalties increase from 2003 to 2011. As for large hits to royalties, both the US and tribal lands experienced a large drop between 2019 and 2020. During this time, coal royalties went from $80 million down to $28 million. Tribes also faced a different experience in royalties the last few years. The US experienced a large royalty drop in 2015 and then reduced at a slower rate whereas tribes saw increased royalties in 2018 and 2019 before dropping in 2020.

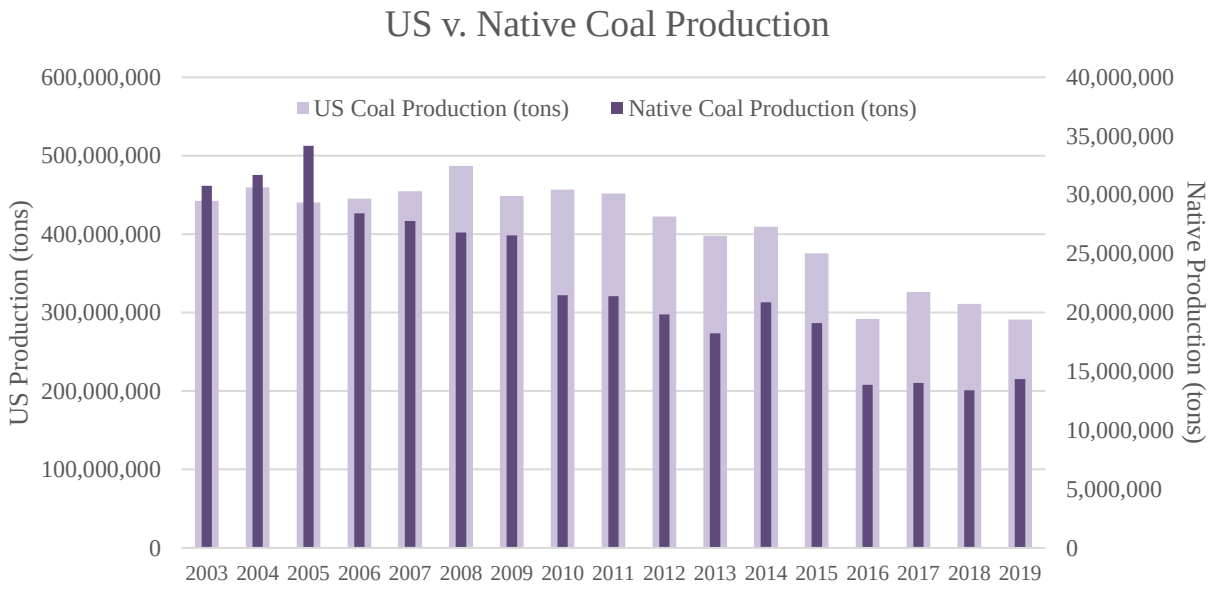

Figure 2: Coal Production in the US and on Native Reservations. Data from: (Department of the Interior, n.d.)

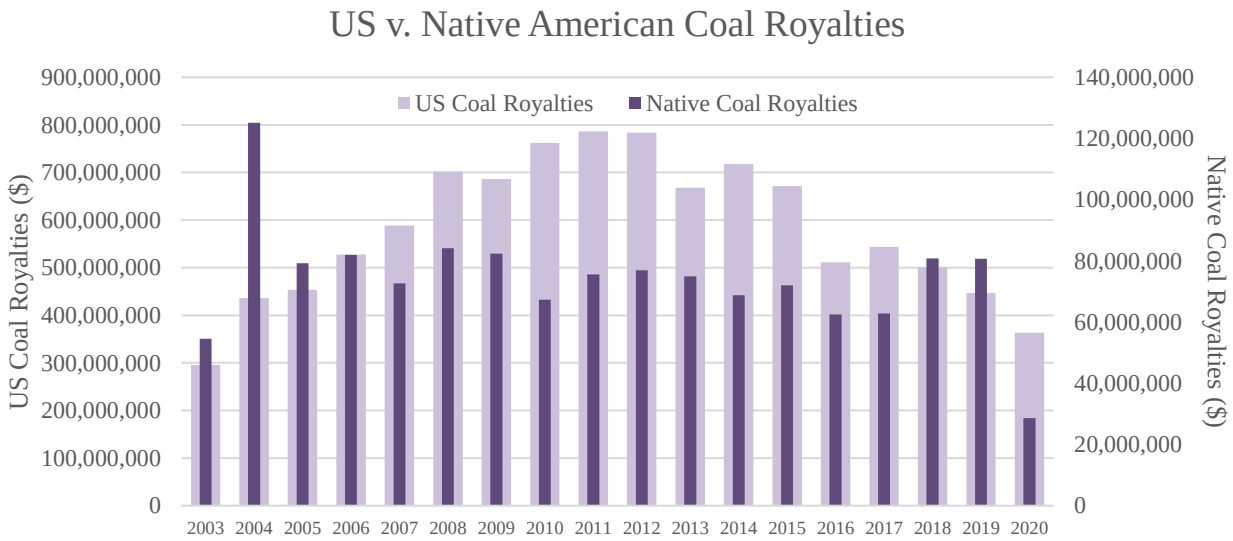

Figure 3: US and Native American Coal Royalties. Data from: (Department of the Interior, n.d.)

Natural Gas

Natural gas production on native lands has been increasing over the past three years. This is a different from US production, which has been falling since 2003 and then remained constant at 4 billion mcf for the past three years (Department of the Interior, n.d.). In 2019, tribes produced 400 million mcf of gas. In terms of royalties, both native and US earnings fluctuated, slowly decreasing over time. Between 2008 and 2009,

royalties for Native Americans dropped significantly from $300 million to $130 million. While it increased slightly since then, tribal earnings from gas never remained the same.

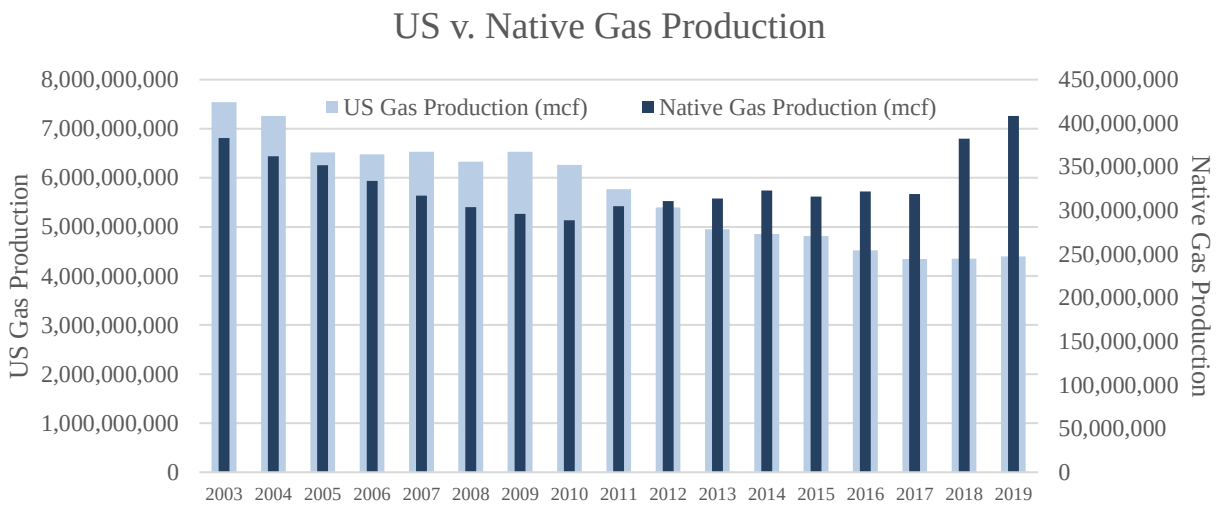

Figure 4: Natural Gas Production on Native Reservations. Data from: (Department of the Interior, n.d.)

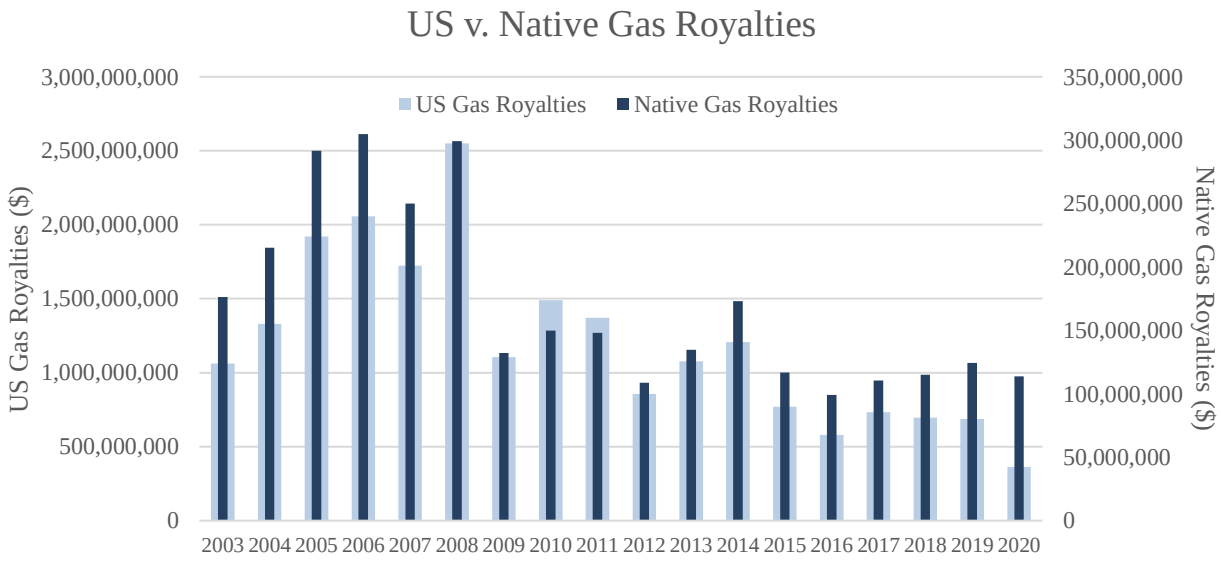

Figure 5: Native American Oil and Gas Revenue. Data from: (Department of the Interior, n.d.)

Oil Production

Oil is the real money maker on tribal land. Native Americans produce roughly a tenth of oil in the country, the majority of which is produced by ten tribes. The top producing tribes include the Mandan, Hidatsa, and Arikara, also referred to as the Three Affiliated Tribes in North Dakota; the Southern Ute in Colorado; Navajo and Jicarilla Apache in New Mexico; and the Northern Arapaho, Wind River Eastern, and Shoshone in Wyoming (Estus, 2020). Similar to the rest of the US, this production has been on the rise since 2008.

However, royalties have not followed this trajectory. One explanation is that oil companies misreported some production numbers, an issue tribes have expressed since the 1970s (Clarren, 2018). Some of this has been paid back to tribes, as in the case when President Obama charged BP Oil $5.2 million for not paying the Southern Ute tribe for uncounted, extracted resources (Clarren, 2018). At the same time, there are still reports that the BIA does not give tribes royalties on time. Even in 2020, tribes have noted that tribes receive royalties 45 days after the date of production (Estus, 2020). On top of this, there are still not up to date oil and gas well surveys, meaning that there is still risk of tribes receiving lower royalty payments.

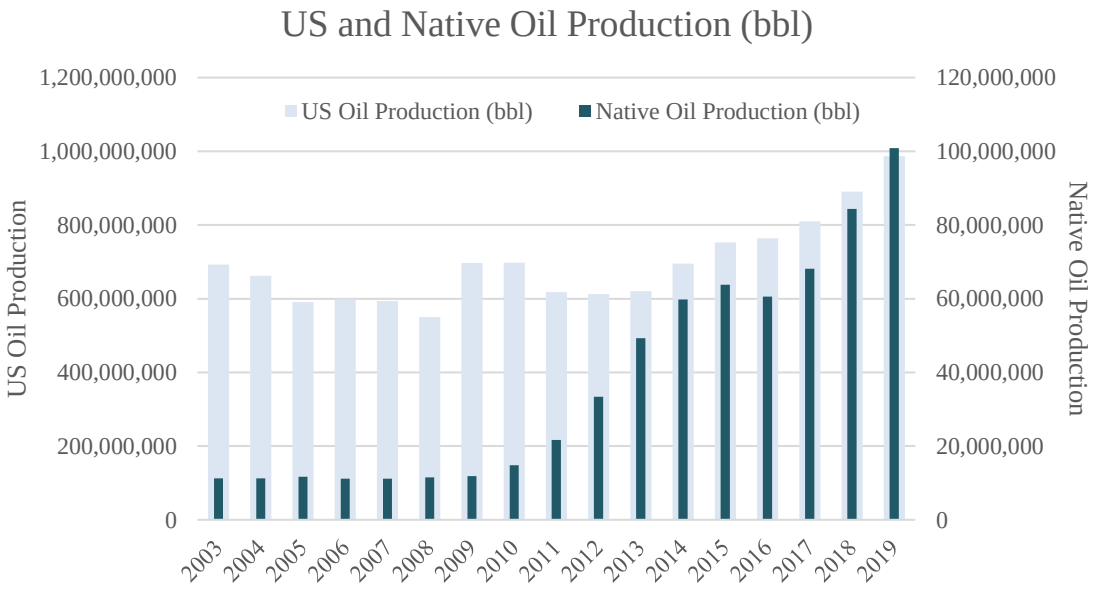

Figure 6: Oil Production on Native Reservations. Data from: (Department of the Interior, n.d.)

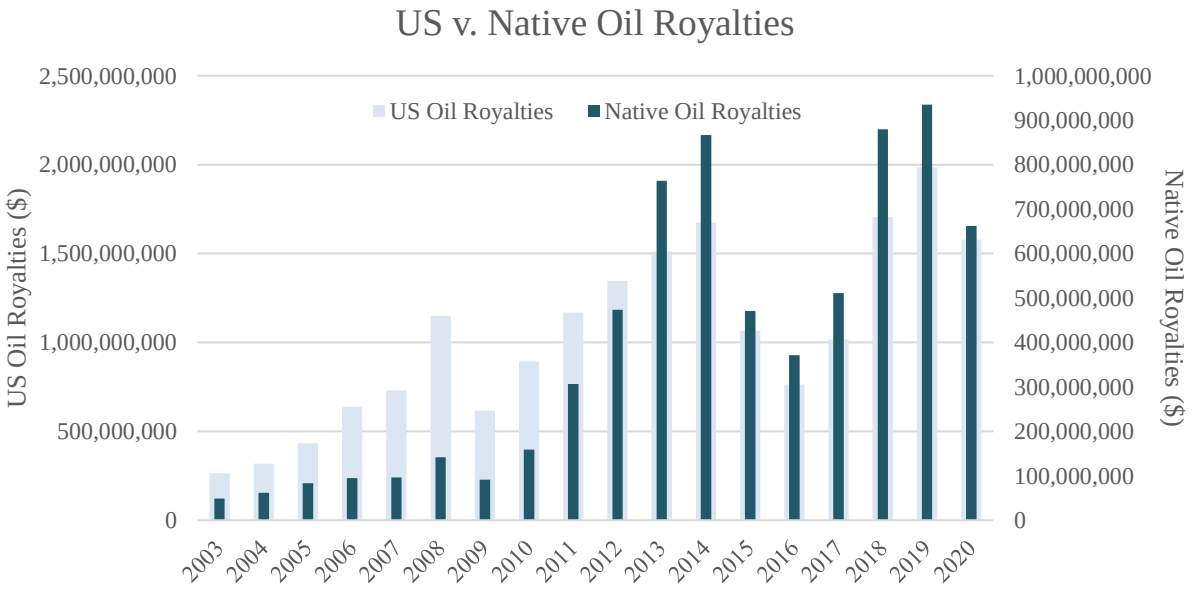

Figure 7: Oil Royalties on Native Reservations. Data from: (Department of the Interior, n.d.)

As seen in Figure 7, natives experienced a large bust from 2014 to 2015 when royalties went from $866 million to $470 million. Royalties continued to drop till 2016, after which natives saw an increase until 2019. Unfortunately, tribes experienced another large hit and lost $273 million in royalties in 2020.

Since 2003, coal, gas, and oil have provided tribes with over $11.4 billion in royalties (Department of the Interior, n.d.). As Figure 8 shows, oil royalties contribute $7 billion, equating to 60 percent of all royalties. As mentioned before, these royalties play a large role in tribal revenue that is used to provide healthcare, maintain infrastructure, and run schools on tribal land. Chairman Mark Fox of the Three Affiliated Tribes estimates that 90 percent of tribal revenue comes from oil alone (Estus, 2020). And this reliance on fossil fuels is particularly concerning because a transition has the potential to take away $800 million or more in annual revenue. It also makes any disturbances to the system dangerous to tribes. For instance, between 2019 and 2020, tribes lost about 30 percent of their annual royalties ($335 million) due to the COVID-19 pandemic. Losing tribal revenue puts serious financial pressure on tribes, especially those that relied on these industries to provide economic opportunities.

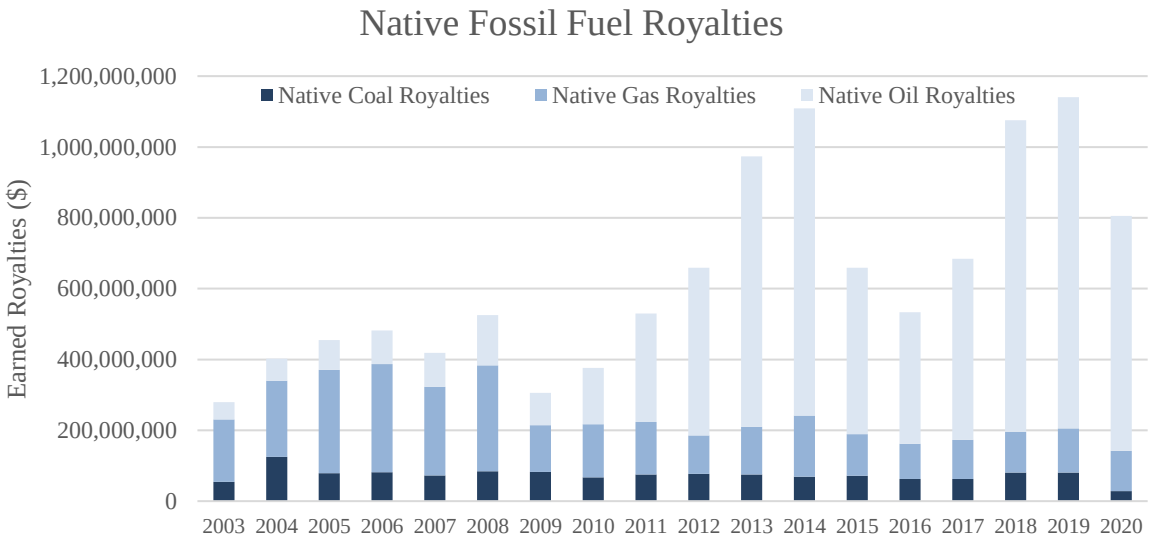

Figure 8: Native Fossil Fuel Royalties. Data from: (Department of the Interior, n.d.)

Already, we are seeing signals of change, for example when President Biden stepped into office and shortly issued a 60-day suspension on new drilling permits. While environmentalists were overjoyed, there was pushback by communities reliant on oil and gas. The Chairmen of the Ute Indian Tribe wrote a letter to the Acting Secretary of the Interior, asking for an exemption from the executive order saying that the "order [was] a direct attack on our economy, sovereignty, and our right to self-determination" because the "the Ute Indian Tribe and other energy producing tribes rely on energy development to fund our governments and provide services to our members" (Walker, 2021.).

Decarbonization policy is necessary to combat climate change. However, policymakers are not only transitioning energy technology, but they are also changing local economies and individual livelihood. Therefore, policymakers will need to help soften the negative impacts by filling the financial gap that tribal nations will face.

I recognize that some policymakers may argue that federal funding should not replace fossil fuel revenues based on utilitarian or libertarian principles (Cozzens, 2007). From a utilitarian standpoint, advocates would say that funding should only be distributed if total well-being is reached. So how would replacing tribal fossil fuel royalties help the rest of the US population? To that point, I argue that climate change and its impacts do not have borders. Therefore, it is within the government's interest to transition tribes because without federal assistance, tribes may continue to produce high carbon emitting products for economic reasons. This would eliminate progress that the rest of the US is trying to make going forward.

Additionally, federal programs are already assisting communities that are reeling from the drop in coal production, but there has been little financial support for tribes. For example, the Assistance to Coal Communities (ACC) grants distributed $759,393 directly to tribes between FY2012 and FY2018. (U.S. Economic Development Administration, n.d.). This is significantly less than the $79 million that the rest of the country received in this same fiscal period[1]. Similarly, tribes were given $3.1 million in Economic Adjustment Assistance (EAA) grants between FY2012 and FY2018 compared to the $267 million given to the rest of the US (U.S. Economic Development Administration, n.d.).

Therefore, I recommend that a federal program provides transitional funding to tribes that are particularly reliant on fossil fuel royalties through the EAA grant program. EAA should appropriate $570 million per year (equivalent to 50 percent of tribal fossil fuel royalties in 2019) for five years and then decrease by 10 percent each year for the following five years. These funds should be separate from the rest of EAA grants, so that tribes do not have to compete with other communities.

From a libertarian point of view, some policymakers might say that the primary role of the government is to protect transactions and manage property rights (Cozzens, 2007). However, as mentioned earlier, the BIA has a history of mismanaging tribal funds. This demonstrates that federal agencies have not protected transactions for federally recognized tribes. For property rights, agencies also have a history of restricting how tribes can manage their land. In the next section, I will illustrate that the Tribal Energy Resource Agreements (TERAs) and other legislation restricts tribes' ability to use their land for energy development.

Luckily, indigenous communities have incredible access to renewable resources. Yet, it will require policy reform to address the many barriers that tribal nations will face in developing clean energy projects, which I will point out in the next section.

2.12 The Power Structures that Hinder Indigenous Energy Development

Despite, indigenous communities' incredible access to energy resources, land management and community governance structures add extra hurdles to indigenous communities' attempts to transition.

Historical Land Management Legislation

[1] Neither of these values include ACC funds given to San Juan College and Navajo Technical University, which both have large American Indian populations (U.S. Economic Development Administration, n.d.).

The origin of these barriers go as far back as 1830, when Andrew Jackson relocated Indian tribes to land west of the Mississippi because Indians pushed back against white assimilation (Editors, n.d.). This led to humanitarian crises like the Trail of Tears when the Choctaw, Chickasaw, and Creeks were forced west to pieces of land that were allocated based on the treaties. However, to this day, Indian land ownership is still a problem that indigenous communities face. For example, the legal case of McGirt v. Oklahoma questioned land rights and self-governance for the tribes who walked the Trail of Tears ("The Ruling," n.d.). While the verdict sided with the tribes, it is appalling that this occurred in 2020 and further illustrates the continual struggle that indigenous communities face across the US (*McGirt v. Oklahoma*, 2020).

Following the Trail of Tears, the reservation system was created as part of the Indian Appropriations Act in 1851, which restricted tribes from leaving their designated plots of land (Editors, n.d.). This legislation along with the Dawes Act not only gave tribal members inadequate resources to make use of their new land but also changed roles in the household. For instance, women were forced out of the land manager roles that they previously had carried and forced into more domestic duties (Editors, n.d.). This meant that the men who hunted and protected the tribe before were forced to take on the land manager roles. More importantly, each tribe was allocated differently. Land was not only designated to federally recognized tribes but also individual landowners.

Today, Congress still has statues that outline rules for various activities and the overlapping nature of the agencies makes processes more convoluted. Federal land management is one of those complications. Based on the type of federal land, tribes face issues like how funds are distribution and how land is acquired, managed, and protected, that will impact how federally recognized tribes develop energy projects in the future.

There are three main types of tribal land: trust land, restricted fee land, and fee lands. Trust land are "owned by the United States for the benefits of tribes and tribal members" (*Tribal Land and Ownership Statuses: Overview and Selected Issues for Congress*, 2020). Restricted fee land is owned by tribes but prohibited from being sold or used as collateral, limiting what tribes can do with it (*What Is Holding Back Renewable Energy Development in Indian Country?*, 2019). Fee land is owned by tribes and able to be sold or transferred without approval. This means that for some tribal energy projects, developers will not only have to consult with tribes but also the individuals who own the land or get permission from the Department of Interior. As seen in Figure 9, even parcels of land within a tribe will have varying restrictions to deal with. For example, project developers will need to work with the tribe to get the BIA to approve a lease or drilling permit and possibly get approval from other agencies or individual land owners depending on the land designation of the project site (*Tribal Land and Ownership Statuses: Overview and Selected Issues for Congress*, 2020).

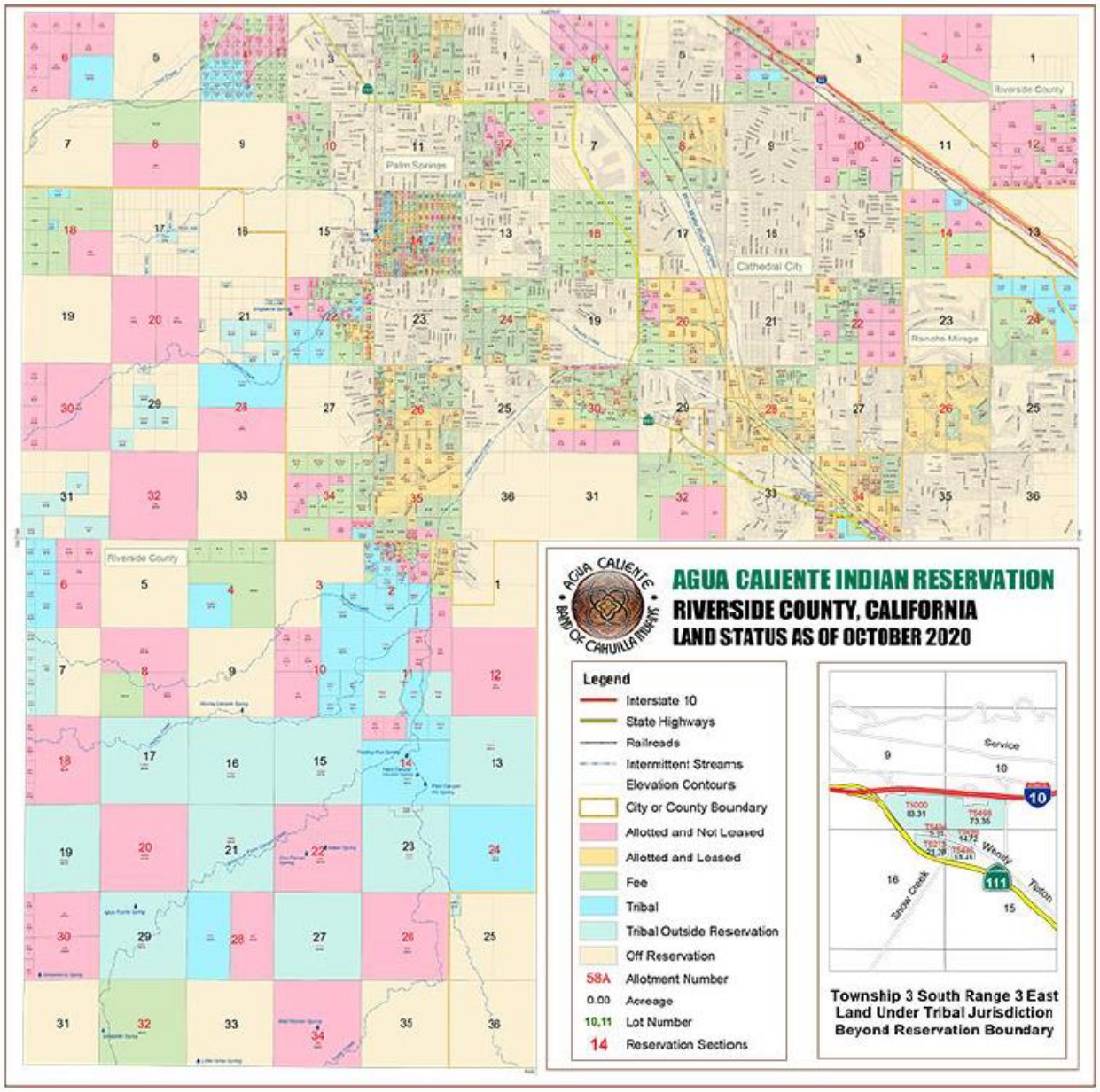

*Figure 9: Tribal Land Designations on Agua Caliente Indian Reservation. Image from: (*Tribal Land and Ownership Statuses: Overview and Selected Issues for Congress, *2020)*

Another cumbersome process is the Indian Tribal Energy Development and Self-Determination Act (ITEDSA) of 2005. This act originally intended to provide federally recognized Indian tribes the option to have more control over energy projects using Tribal Energy Resource Agreements, also known as TERAs (*Tribal Land and Ownership Statuses: Overview and Selected Issues for Congress*, 2020). Based on the Secretary of the Interior's evaluation on whether a tribe "demonstrated sufficient capacity to regulate an energy resource", the Secretary will grant a tribe a TERA so they can enter into a business agreement and lease for energy resource development (*Tribal Energy Resource Agreements (TERAs): Approval Process and Selected Issues*, 2020). This extends to granting rights of way over tribal lands for pipelines or electricity transmission. However, a GAO report found that ITEDSA had a cumbersome application

process, put additional costs on tribes, and created uncertainty, causing tribes not to enter TERAs (*Tribal Energy Resource Agreements (TERAs): Approval Process and Selected Issues*, 2020). And the complexity made it harder for tribes to get projects started than it would elsewhere. One tribal leader noted it took 49 steps to allow oil and gas exploration on tribal land compared to the 4 steps that private industry needed to complete within state borders (*Tribal Energy Resource Agreements (TERAs): Approval Process and Selected Issues*, 2020).

Despite numerous complaints to the ITEDSA, amendments that clarified the certification process and provided financial assistance, took over a decade to come to fruition. And still, the TERA process was used against tribes recently. In 2019, the Secretary of Interior at the time issued a Secretarial Order 3377 which listed activities that a TERA could not be used for like oil and gas development (*Tribal Energy Resource Agreements (TERAs): Approval Process and Selected Issues*, 2020). Not only did this order restrict economic development opportunities for tribal communities, but it was also anti-sovereign. From the creation of reservation systems to the ITEDSA, these pieces of legislation demonstrate recognitional injustice, treating indigenous peoples unlike the sovereign nations they are.

In addition to the restrictive nature of the ITEDSA, tribes' experience the weight of poor agency management. For instance, the BIA's role in the energy project development on tribal land prevents tribes from making the most of their land. The BIA is the federal agency responsible for the administration and management of the 55 million surface acres and 57 million acres of subsurface mineral estate for tribal interest. BIA also manages programs for tribal governments like healthcare, law enforcement, social services and more. As it stands, the BIA's mission is "to enhance the quality of life, to promote economic opportunity, and to carry out the responsibility to protect and improve the trust assets of American Indians, Indian tribes and Alaska Natives" (*Bureau of Indian Affairs (BIA) | Indian Affairs*, n.d.). However, the BIA has a track record of not meeting tribal needs.

According to a GAO report, the BIA partially met areas of progress related to capacity, action plan, and monitoring (*Improving Federal Management of Programs That Serve Tribes and Their Members*, 2019). The GAO found that the BIA only met its leadership commitment which was due to improving regulations of TERA process – a process, which to this day still struggles to be used properly. These challenges create barriers for tribes to carry out energy projects. For energy projects, the GAO found that BIA needs to develop a comprehensive energy development plan, create performance metrics, and reduce the backlog of leases and permits. It also called for an evaluation of the agency's workforce skills and improve recruitment. This progress will hopefully be improved when the Office of Personnel Management (OPM) conducts a workforce analysis in 2021, which will give the agency a picture of its workforce needs to better serve tribes (*Improving Federal Management of Programs That Serve Tribes and Their Members*, 2019).

One more challenge that tribal nations face is not being able to take advantage of federal tax credits (Select Committee on the Climate Crisis, 2020). This is because "tribal governments are considered sovereign, non-taxable entities and cannot use [renewable energy] financial incentives" (Jones & Necefer, 2016). In other words, tribes cannot utilize federal renewable incentives for projects they deploy on their own land. Instead, tribes can offer non-tribal companies access to land with tax breaks if energy projects are deployed on tribal land. In the end, this forces tribes to decide between 1) leasing land for a non-tribal project and receiving revenues at a fraction of the cost that tribes would have made if they built the project or 2)

deploying the project on their own at a higher cost without utilizing federal tax incentives. Therefore, I recommend that Congress allow tribes to access federal renewable energy tax incentives.

Ultimately, federally recognized tribes operate under a different environment compared to other marginalized communities, demonstrating distributional and recognitional injustices to indigenous people.

2.13 Tribal Renewable Landscape

Indigenous people play an important role in the US, as tribal lands contain 6.5 to 13 percent of the technically feasible renewable energy resources. The federal government has been one of the main funding sources for renewable energy development on tribal land. The key program that supports tribal energy development is the Department of Energy (DOE) Tribal Energy Program, which gives funding to federally recognized tribes with the purpose of implementing clean energy. Since 2009, the program has awarded the following in grants (*Tribal Energy Project Funding History*, n.d.):

- Planning: $13.8 M
- Feasibility: $8.9 M
- Development: $5.8 M
- Deployment: $55.5 M

This adds up to a total of more than $84 million for 186 projects across the country over 10 years. This funding is nowhere near what tribes make from royalties. To put it in perspective, in 2020 alone, tribes made over $800 million in royalties and only received $13.4 million from DOE Tribal Energy Program funding. Even the $335 million loss in royalties between 2019 and 2020 is four times more than all funding given to tribes through TEP since 2009, all to deploy 32 MW worth of clean energy. This is equivalent to less than 6 percent of the energy produced in Los Angeles' largest solar array (*Top 5 Biggest Solar Farms in the US*, 2020). Funding also has been quite sporadic as seen in Figure 10. In FY2019, $13.8 million was granted for 36 projects which is almost twice the amount the year before when $7.8 million was given (*Tribal Energy Project Successes*, n.d.). On top of that, tribes have to compete for funding, ultimately pitting tribes against each other.

To address these issues, I recommend that DOE create a dedicated fund within TEP and eliminates the competitive grant program. As I will discuss further in section 2.14 and in the select New Mexico case studies, high initial costs for renewable energy projects prevent tribes from building out clean energy projects. Therefore, the government should provide additional financial support. This recommendation is made with the understanding that there might be pushback against government funding under utilitarian and libertarian principles. From a utilitarian point of view, it is within the best interest of the US population to support clean energy development on tribal land in order to meet national decarbonization targets by using all technically feasible renewable resources. As for libertarian concerns, I remind the reader that the government has not properly managed tribal land property rights, restricting how tribes can use their land, and thus tribes should receive support to restore past inequities.

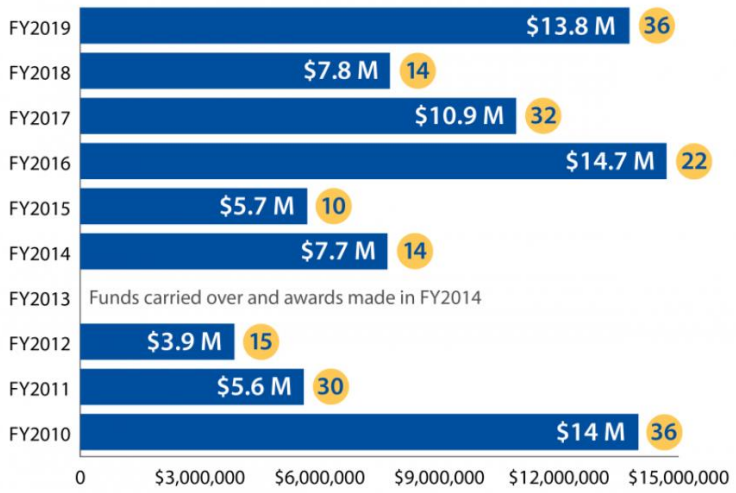

*Figure 10: DOE Tribal Energy Program Funding since FY 2010. Image from:(*Tribal Energy Project Funding History, *n.d.)*

In terms of how funding should be distributed, I recommend that tribes that have not participated in TEP previously should be guaranteed at least $300,000 to evaluate their renewable resources through a feasibility study[2]. For tribes that have not participated in TEP and are not reliant on fossil fuel royalties, I recommend that TEP dedicates at least $1.2 million per tribe to guarantee funding for first stage planning grants and a small deployment project. And finally, I recommend that TEP increase annual grant funding to $570 million per year (equivalent to 50 percent of tribal fossil fuels in 2019) for five years and then decrease by 10 percent each year for the following five years. The $570 million would be available to all tribes, distributed by set of criteria that takes into account: unemployment rates, population, industry composition, and other demographic information.

2.14 The Case for Encouraging Tribal Utility Authority Formation

As I showed in the previous sections, the current energy system perpetuates distributive, recognitional, and procedural injustices. In order to make up for these inequities, I recommend that Congress and federal agencies to promote tribal energy sovereignty, or energy independence, by increasing support for tribal utility authority formation (TUA). This allows tribes to create their own energy system to better serve tribal members while lowering electricity costs and designing their own energy future. To illustrate the benefits and challenges of forming a TUA, I describe the Tohono O'odham tribe's experience.

Tohono O'odham Tribal Utility Authority

The Tohono O'odham tribe is located in southern Arizona. Before the Tohono O'odham Utility Authority (TOUA) was created in 1970, the tribe bought its electricity from a large electric coop (*Tribal Authority Process Case Studies: The Conversion of On-Reservation Electric Utilities to Tribal Ownership and*

[2] Based on feasibility studies conducted in New Mexico, the majority of funds granted were under $300,000, except for studies that evaluated hydropower potential are more expensive.

Operation, 2010). However, the coop only provided electricity to the largest villages and refused to supply to any of the small villages. This meant that 27 small, rural villages did not receive power because the coop said that it was too costly to build the infrastructure necessary to deliver power.

For this reason, the Tohono O'odham tribe decided to create a utility and now 50 years later is still operating one. Yet, this came with several challenges. One of the largest challenges is limited access to capital. Indigenous people and tribal governments do not have the funds to make large investments. Therefore, it was hard to buy existing electric infrastructure, develop energy projects, and even conduct feasibility studies to see if it is even economically feasible to build out an idea. Another challenge was the lack of utility management expertise and other professional experience within the tribe that was necessary to successfully seeing a project through. However, combined with the difficulty in getting enough capital, it made it twice as hard for tribes to outsource an expert. The tribe also faced difficulty in training a workforce that could operate and maintain such infrastructure. And finally, the tribe faced resistance from its electricity supplier. This made it difficult to create a utility authority and get electricity to tribal members who need it most.

To overcome these challenges, the Tohono O'odham took a gradual investment approach. They slowly attained electricity infrastructure from the utility nearby and used earned revenue on those assets for future investments (*Tribal Authority Process Case Studies: The Conversion of On-Reservation Electric Utilities to Tribal Ownership and Operation*, 2010).

Other Tribal Utility Authorities

As a report found, tribes are motivated to create a tribal utility authority because of frustration with their current energy supplier (*Tribal Authority Process Case Studies: The Conversion of On-Reservation Electric Utilities to Tribal Ownership and Operation*, 2010). Tribes were also driven towards utility formation because of the desire to give electricity to rural tribal members when their energy supplier did not want to. And finally, tribes were inspired to be in charge of their energy supply and resources. The Navajo Nation, the Fort Mojave Tribe, and the Cow Creek Band of Umpqua Tribe have also been able to form their own tribal utility. (*Tribal Authority Process Case Studies: The Conversion of On-Reservation Electric Utilities to Tribal Ownership and Operation*, 2010). Yet, the path towards establishing a utility was quite different by tribe. For instance, the Navajo Tribal Utility built its system from scratch including supporting infrastructure like distribution systems (*Tribal Authority Process Case Studies: The Conversion of On-Reservation Electric Utilities to Tribal Ownership and Operation*, 2010). It is important to note that this is an unlikely trajectory for most tribes as this requires large upfront investments that tribes have difficulty acquiring. As for the Fort Mojave Indian Tribe, the Aha Macay Power Service was built to offset high energy costs from a new economic development project in 1991. The savings were then used to grow the utility further. Other tribes like Standing Rock are currently in the process of forming their own utility with the goal of changing their energy future.

Additionally, some tribes' electricity is managed by BIA owned utilities (Gold, 2012). While this might relieve the tribe of some financial burdens, it does not allow the tribe to have as much control over energy and growth planning (*Tribal Authority Process Case Studies: The Conversion of On-Reservation Electric Utilities to Tribal Ownership and Operation*, 2010). Additionally, the incredibly short planning horizons

of BIA owned utilities does not give enough time for dedicated renewable project development and does not necessarily guarantee employee hiring preferences as well as buying preferences. For these reasons, to increase energy independence and tribal sovereignty, tribes under a BIA utility should be given the resources and opportunity to decide on whether they stay with their current utility or create their own.

Continuing to let investor-owned utilities take advantage of tribes and supplying inadequate funding to revamp its energy system will not lead to an inclusive, equitable indigenous energy transition. In order to ensure an energy independent future, policymakers must align policy with indigenous cultural beliefs and give tribes the opportunity to determine how they manage their electricity by encouraging them to create their own tribal utility authorities. This will not only help tribes take charge of how they produce energy and who they give it to but provide revenues. By deploying large clean energy projects, tribes can sell power to outside buyers like large private actors trying to reduce their fossil fuel consumption and begin to fill in the funding gap that has been provided by royalties.

To promote change, policymakers can utilize the existing financial assistance programs in the Division of Energy and Mineral Development under the Office of Indian Energy and Economic Development (IEED). The Tribal Energy Development Capacity (TEDC) grants are specifically designed to explore TUA feasibility, establish an energy focused business, and manage legal barriers for tribal energy projects (*What Is the Tribal Energy Development Capacity (TEDC) Grant? | Indian Affairs*, n.d.). However, there is little funding allocated for this program. In FY2019, $1 million in TEDC grants were given to 11 tribes to conduct a TUA feasibility study, four times less than the $4.6 million originally requested (*Past Funded TEDC Grant Projects | Indian Affairs*, n.d.). As seen in Table 1, between FY2015 and FY2018, a total of $12.5 million in TEDC grants was not funded.

Table 1: FY2015-2018 Tribal Energy Development Capacity Grants that were Requested, Funded, and Not Funded

TEDC Funding Gap FY2015-FY2018			
	Funded TEDC	**Requested TEDC**	**TEDCs Not Funded**
FY2015	$1.6 million	$3.1 million	$1.5 million
FY2016	$1.4 million	$7.2 million	$5.8 million
FY2017	$1.7 million	$3.3 million	$1.6 million
FY2018	$1.0 million	$4.6 million	$3.6 million
Total	**$5.7 million**	**$18.2 million**	**$12.5 million**

Therefore, I recommend that Congress appropriates at least $5 million per year for five years that IEED can use for TEDC grants. Increased funds will allow IEED to give grants to TEDCs not funded previously as well as jump start TUA formation.

2.2 Federal Tribal Workforce Development

When you talk about energy, you talk about politics, you talk about the economy, you talk about jobs[3] (Poulsen, n.d.). The race against the worst effects of climate change inevitably leads to politically charged

[3] Phrase inspired from Atlantic piece in 2021 “When you talk about fish, you talk about politics, you talk about the economy, you talk about jobs.”

discussions and overpromises about jobs and the economy. But what does the indigenous workforce look like currently?

2.21 Federal Tribal Energy Employment

Of the reported 5.8 million US energy workers in 2020, there are 88,659 indigenous energy workers[4] (*2020 US Energy and Employment Report*, 2020). This equates to about 1.5 percent of national energy employment in the United States. As seen in Figure 11, indigenous energy employment has changed in different ways by sector. I aim to give a picture of the current landscape of the indigenous energy workforce, specifically how it has changed over the past few years, how it is expected to change, and what challenges it will face in a transition.

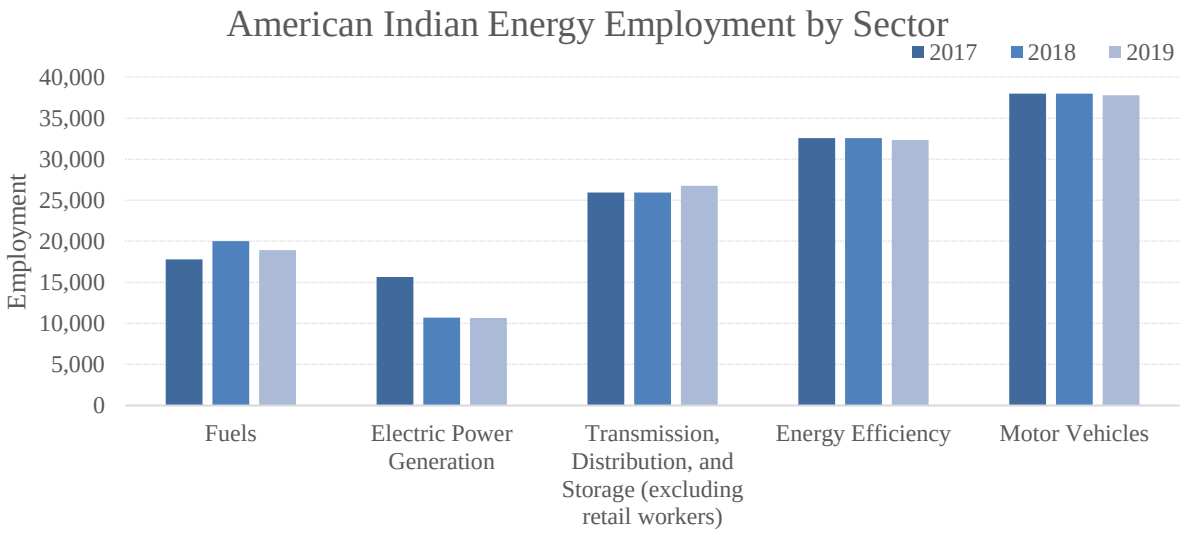

Figure 11: Indigenous Employment by Energy Sector from US Energy and Employment Reports (2018-2020) this corresponds to actual employment in years 2017, 2018, and 2019 respectively.

Fuels

Fuels employment is defined as work related to extraction, mining, processing as well as firms and refineries that support oil, gas and coal. Currently, there are 18, 937 indigenous workers employed by the fuels sector (*2020 US Energy and Employment Report*, 2020). In breaking down employment by technology, petroleum is the highest employer of indigenous fuel workers with 11,387 workers reported. This translates to 60 percent of total indigenous employment in the fuels sector. This is followed by natural gas which has 4,438 indigenous workers, and then coal with 1,456 individuals. In the past few years, indigenous fuel workers experienced an employment jump between 2017 and 2018, adding 2,241 workers. However, this

[4] The number of self-identifying American Indian energy workers is 88,659. This value does not include Native Hawaiian and Pacific Islander as the US Energy and Employment report separates these ethnicities.

employment gain decreased by half in the following year. This was not the case for the rest of the US fuels workforce, which saw a 1.9 percent increase in employment.

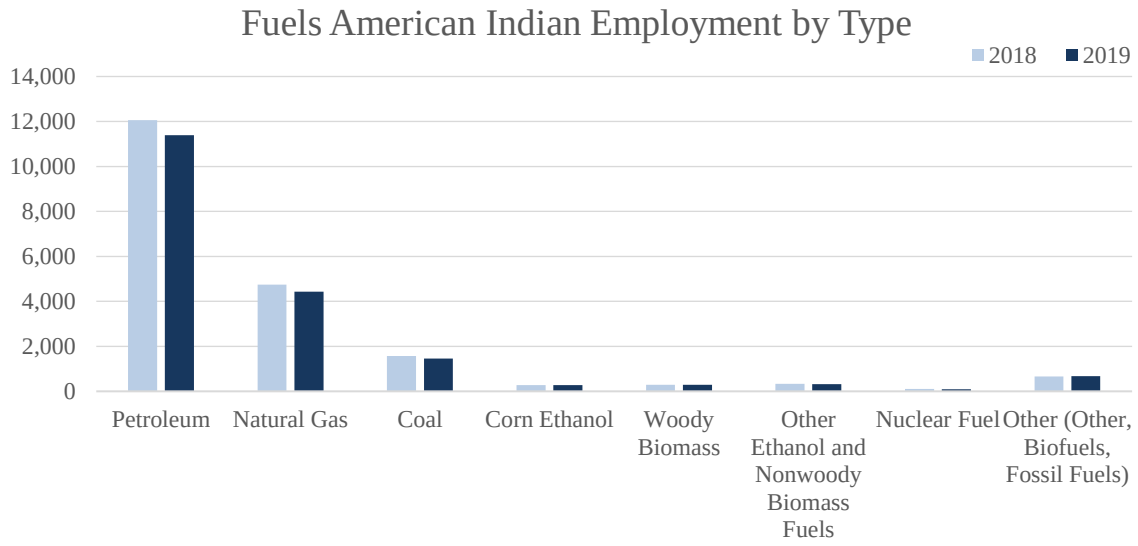

Figure 12: American Indian Employment by Fuel Type from US Energy and Employment Reports 2019-2020

It is important to note that energy sector employment is also broken down by industry: mining and extraction, manufacturing, professional and business, wholesale trade, agriculture and forestry, construction and other. While fuels sector employment for indigenous workers is not available for each sector, it is available for the US fuels sector. Based on the US Energy and Employment Report, mining and extraction makes up almost half of the nation's workforce with a reported 535,210 workers and followed by manufacturing 47,336 workers. This information is important to remember as mining and extraction industries is an area that might be harder to transfer workforce skills.

According to the US Energy and Employment Report, the US fuels sector is expected to grow by 1.7 percent in the next year. However, it is unclear whether this growth will be felt in indigenous communities, especially if in the past year employment decreased for indigenous workers but grew for the rest of the population.

Electric Power Generation

Electric power generation employment (EPG) refers to either conventional or renewable energy technology that is used to generate electricity. The EPG workforce reported 896,830 workers in the US in 2019, of which 10,644 identified as American Indian (*2020 US Energy and Employment Report*, 2020). In breaking down EPG by technology, solar has the most employment with 4,691 native workers. This accounts for 43 percent of employment in the sector, which is 1.5 times higher than the percentage of the nation's EPG to solar share. This is followed by natural gas which employs 1,511 native workers and 1,359 natives in wind.

Overall, electric power generation employment experienced a large employment decline between 2017 and 2018 and remained constant ever since. If you look at how employment has changed by technology, EPG

employment in solar has increased by 114 native workers in the last year, whereas coal lost 148 native workers. Natural gas and wind stayed relatively constant.

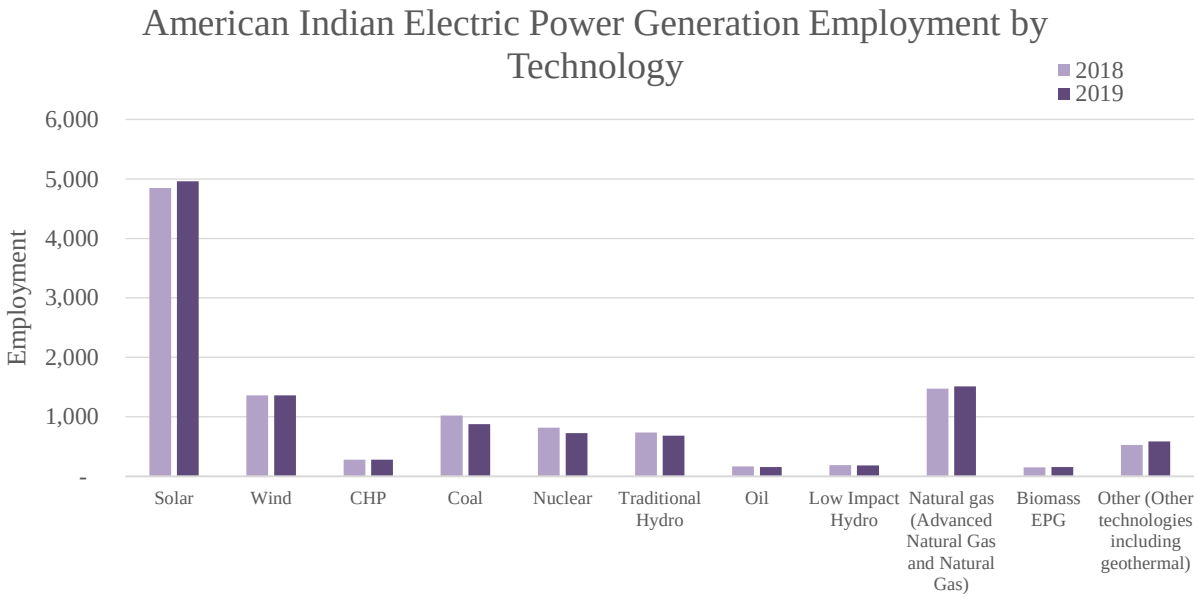

Figure 13: Indigenous Employment by Fuel Type from US Energy and Employment Reports 2019-2020

The future for employment looks promising in electric power generation. It is estimated that EPG employment will increase by 4.8 percent in the next year. Additionally, the construction industry makes up the largest share of the EPG workforce. With 74 percent of workers in the construction industry, this offers hope for workers involved as there are more transferable skills across technologies. However, electric power generation is known to have a smaller percentage of its workforce unionized and has lower paying positions (*2020 US Energy and Employment Report*, 2020). This is important to keep in mind when I speak about potential worker inequities that indigenous energy workers face.

Transmission, Distribution, and Storage

Transmission, distribution, and storage (TDS) employment includes all personnel involved in TDS infrastructure like all interstate and intrastate pipelines, natural gas storage facilities, railways, high-voltage transmission lines and distribution lines. It is important to note that this excludes retail workers who work in gas stations. In the past few years, the TDS sector saw a slight increase in the workforce. Currently, there are 1,383,646 TDS workers in the United States where 26,744 of those are native (*2020 US Energy and Employment Report*, 2020). Most employment by industry in TDS is in utilities and construction. However, there is little information about how native employment breaks down by TDS industry.

Between 2017 and 2018, TDS employment for natives stayed constant. But this changed the following year, when 815 native workers were added, marking a 3.1 percent increase. Future TDS employment is estimated to grow 3.5 percent in 2020 and potentially even further if President Biden is able to pass the American Job's Plan, which initially proposed $100 billion in investments to upgrade the electric grid (Morehouse, 2021).

Energy Efficiency

Energy efficiency employment is defined as jobs that produce or install energy-saving products that reduce energy consumption from appliances, buildings, and vehicles. In the US, there are 2.3 million energy efficiency workers, making up the largest percentage of the energy workforce (*2020 US Energy and Employment Report*, 2020). Of the 2.3 million workers, there are 37,772 natives working in energy efficiency. Employment stayed steady between 2017 and 2018, but energy efficiency lost 224 workers in 2019. This resulted in a 0.5 percent drop in native EE employment, much different from what the rest of the EE workforce is seeing. Between 2018 and 2019, the energy efficiency sector experienced an employment increase of 2.3 percent and the sector is expected to grow another 3 percent in 2020.

Like the fuels sector, changes in energy efficiency employment between years for natives has not followed the rest of the energy workforce. While there are no specific reasons for what is causing a drop in employment, potential reasons could be limited research and data collection, which tribes have found is an issue in any census or employment survey. Another reason that is not specific to energy efficiency, could be explained by looking at the native workforce pipeline itself.

2.22 Indigenous Workforce Pipeline

To meet the deep decarbonization goals, it will be important to include indigenous workers in the transition. However, as noted above, natives are not following the same trajectory as the rest of the American workforce. In this section, I aim to look at why native employment is not following along the rest of the US by investigating the workforce pipeline and highlight potential barriers for indigenous workers.

Currently, there are 2.9 million American Indians and Alaskan Natives in the country (Jr.,Vernon, n.d.). Of those, 1.7 million natives participate in the workforce. This equates to a labor participation rate 60.3 percent labor participation, which is lower than the 62.8 percent national labor participation rate. The Bureau of Labor Statistics notes that labor force participation varies a lot by characteristics like age, gender, and educational attainment. For natives between 16- and 24-year-old, the labor force participation is closely related to whether the individual is in school (Jr.,Vernon, n.d.). By gender, men participate in the labor force at a much higher rate than women. Table 2 shows how educational attainment differs by men and women.

Table 2: Labor force participation by gender and educational attainment (Jr.,Vernon, n.d.)

	American Indian Men (percent)	American Indian Women (percent)
Less than high school diploma	68.7	56.1
High school graduation, no college	60.4	37.4
Some college or associate's degrees	66.1	71.5
Bachelor's degree or higher	79.1	71.0

Similarly, Native Americans experience much higher unemployment. Average unemployment between 2016-2018 was reported at 7.8 percent, which is much higher than the national average of 4.4 percent.

However, this varies by whether the individual lives on tribal land or not. As seen in Table 3, natives who resided on tribal land had a significantly higher unemployment (Jr.,Vernon, n.d.). The most staggering difference is for native men – those living on tribal land averaged a 14.6 percent unemployment rate compared to those who lived off tribal land, who had an unemployment rate of 6.2 percent. This disparity also exists for 16- to 24-year-old workers in which 22 percent of those living on tribal land were unemployed, twice as high as those who lived off tribal land.

Table 3: Unemployment rates for American Indian and Alaska Natives (Jr.,Vernon, n.d.)

Unemployment rates				
Category	**American Indian and Alaska Native (AIAN)**			**Total population**
	Total	**Residing in AIAN area**	**Not residing in AIAN area**	
Total Unemployment	7.8	11.4	6.6	4.4
16 to 24 years	13.9	22.4	11.2	9.4
25 to 54 years	6.9	10.2	5.9	3.7
55+ years	5	5.2	4.9	3.3
Gender				
Men	8.2	14.6	6.2	4.4
Women	7.4	8.1	7.1	4.3

In addition to poor labor force participation and unemployment, workers also face limited career opportunities and a lack of high education and vocational training. This is confirmed by a survey that the National Congress of American Indians conducted in 2015. Based on survey results that NCAI gathered from 40 tribal leaders and workforce development professionals, NCAI found there were several reasons for why indigenous people fell through the workforce pipeline. Table 4 organizes some of these identified barriers into four categories: communal, environmental, financial, and programmatic challenges (*Empowering Tribal Workforce Development: Indian Country's Policy Recommendations for the Federal Government*, 2020). Communal challenges encompass the issues mentioned above like high unemployment, low labor force participation rates, lack of training programs, and lack of supplemental services like childcare. It also found that while there are senior positions available, the native workforce does not have the skills it takes to move up, forcing employers to outsource roles.

Environmental challenges comprise of challenges related to surrounding infrastructure like access to broadband and physical infrastructure. It also includes challenges to access affordable and reliable transportation. Since these issues are quite entangled, it is important that native interests are represented where it matters. Therefore, I endorse NCAI's recommendation to change WIOA to require at least one seat within state workforce development boards to be dedicated to native workforce issues. Additionally, there should be increased native representation within groups like the new Office of Energy Jobs and the Native American Employment and Training Council. And while not included within the federal policy

jurisdiction, there should be increased native leadership within unions and workforce development consortium like the Center for Energy Workforce Development.

*Table 4: NCAI Identified Workforce Development Challenges (*Workforce Development in Indian Country: The Challenges*, n.d.)*

Communal Challenges	Environmental Challenges	Financial Challenges	Programmatic Challenges
High unemployment rates and low labor force participation rates	Lack of physical infrastructure like workforce training facilities	Insufficient federal funding	Inadequate or inaccurate workforce data and labor conditions
Limited career opportunities overall but especially few private sector jobs and permanent career positions	Limited and poor broadband internet connectivity	Insufficient sustained discretionary funding for workforce programs	Irregular or non existent communication and coordination
Workforce unqualified for senior positions and therefore need to outsource outside	Lack of accessible, affordable and reliable transportation	Restrictions on how funding can be spend and excessive reporting requirements	Lack of qualified native instructors for workforce training
Lack of apprenticeship programs and limited higher education and vocational programs		Limited training and subsidized work experiences	Strict program eligibility requirements
Lack of support services like childcare and short term housing		Lack of knowledge of available funding from federal grants and other sources	Up to date and evolving workforce development programs

Financial challenges include both funding limitations for students and workers as well as financing difficulties for workforce programs themselves. As for students and workers, there is an estimated 43 percent increase in cost of tuition and fees for two year colleges and over 56 percent increase for four year colleges, making it difficult for individuals to enter these programs (*Empowering Tribal Workforce Development: Indian Country's Policy Recommendations for the Federal Government*, 2020). As for programs themselves, tribal workforce development programs have not received an increase of funding which is needed due to the growing native youth population.

According to the NCAI workforce development report, the tribal workforce development programs which support youth are the Comprehensive Services Program (CSP) and the Supplemental Youth Services Program. Funds for these programs have stagnated around $68 million per year, struggling to keep up with rising program costs (*Empowering Tribal Workforce Development: Indian Country's Policy Recommendations for the Federal Government*, 2020). To further support tribes in forming a workforce

development plan and tribal-designed career pathways, I endorse NCAI's recommendation to Congress for increasing funds to the Department of Labor's CSP and Youth Services program. With increased funds, the CSP and Youth Services program and Career Pathways program should look at opportunities as it relates to developing a workforce pipeline that can meet their tribe's renewable energy goals. Ideally, the strategic workforce plan would be done at the same time or in alignment with tribal strategic energy plans as well as educational and workforce training institutions. This will ensure that tribe specific career pathways are created with the renewable goals in mind and begin to train the next generation of indigenous energy workers. Additional funds should also go towards creating a few positions that can coordinate with the Department of Energy's Indian Energy Program and other agencies to align workforce development plans with strategic energy plans.

And finally, programmatic challenges include challenges related to running and operating an education and workforce program. Tribal leaders reported insufficient workforce data, difficulty in finding qualified instructors to train students, infrequent communication, and poor coordination to run programs. Each of these challenges adds obstacles to running a successful program, let alone keeping the information up to date so the curriculum can evolve with student and industry needs. Many of these problems stem from the fact that higher education and workforce training programs do not have adequate funds to hire personnel that can relieve the loads of administrators. Therefore, lack of funds prevent programs from hiring better trained instructors, staying up to date with new industry information, and collecting data.

These workforce and workforce development challenges demonstrate how interconnected and interdependent native workforce issues are as well as how deep the distributional inequities run through tribal nations. For instance, without proper support services like childcare and adequate access to transportation, a native worker cannot go to a place of employment to interview, let alone work. While the COVID-19 pandemic has taught us that we can work or attend class remotely, without proper internet connection, one is disconnected from the rest of society. Even if a native student or worker can push past all of this, current education and training programs struggle to find instructors. Not to mention, program managers are not able to maintain workforce data and stay up to date on the latest industry trends.

While there were initial efforts to fund an American Indian Population and Labor Force Report, NCAI notes there has been little progress (*Empowering Tribal Workforce Development: Indian Country's Policy Recommendations for the Federal Government*, 2020). And any discussion on how to carry this effort out did not include tribal leaders. Therefore, I endorse NCAI's recommendation that any current initiatives related to increasing indigenous workforce data collection should include tribal leaders and be added to workforce data collection initiatives. This includes mandating state workforce reports carve out a section on native workforce numbers as well as the creation of a supplemental report modeled after the US Energy and Employment report. Such efforts will finally count indigenous workers but also track how federally recognized tribes are impacted by the future implementation of President Biden's American Jobs Plan.

To build out a workforce pipeline that meets the needs of tribes, it is important to re-establish a technical assistance program under WIOA that promoted capacity building (*Empowering Tribal Workforce Development: Indian Country's Policy Recommendations for the Federal Government*, 2020). The program previously funded tribal leaders to travel to Washington DC in order to learn from workforce development experts through a workshop and work with tribal leaders to improve their programs. However, the

Employment and Training Agency ended this program and therefore, tribes have little feedback on how to make improvements. Therefore, I recommend re-establishing the program and enforcing any participating technical experts to complete a cultural background training to ensure that professionals abide by cultural customs.

In the end, these problems can be partially addressed with increased funding and technical support. However, to ensure that the indigenous workforce pipeline meets tribes where they are and sets up communities for an equitable energy transition, it is crucial that tribes and native organizations can develop their own solutions and programs. This sentiment is shared by Sterling HolyWhiteMountain, a member of the Blackfeet nation, who said, "not until well into adulthood did I realize that this well-meaning notion rejected not only our communities' need for help, but also their failure to understand that higher education, in the absence of structural change and economic opportunity on the reservation, was likelier to draw young people away from home than to help them make it better" (HolyWhiteMountain, 2018).

Case Study: Gila River Indian Community

With the implementation of these recommendations and increased funding streams, tribes will be able to revamp their workforce. One great example of how tribal nations can redesign the system if given the right resources is the Gila River Indian Community in Arizona. The community is located in southwest Arizona with 22,000 recognized tribal members and also home to numerous successful economic development attributed to projects like an industrial business park, 15,000 acres of crops, a sand and gravel company, and a utility authority (*Workforce Development: Gila River Indian Community*, 2017). While these economic development opportunities offered hope and spurred construction contracts, Gila River quickly found that its tribal workforce was not trained for the available opportunities. This forced construction contracts to go to non-tribal contractors. Additionally, tribal members were not aware of opportunities available to them, and tribal leaders had difficulty getting members to make use of opportunities because the opportunities were misaligned with their interests.

To combat these challenges, Gila River applied and was awarded a technical assistance grant which selected members of the tribe's employment and training department to attend a Career Pathways workshop. Better yet, after completing this training, Gila River was given $3 million to implement its designed model within three years (*Workforce Development: Gila River Indian Community*, 2017). This funding allowed for Gila River to gather information on their people's concerns, talents, and aspirations that led to the creation of a workforce development plan that fit their desires and matched employer needs. Further successes included the creation of a resource guide which tribal members could access, and the Gila River departments came together with the National Center for Construction Education and Research and the Arizona Builders Alliance to develop a recognized pre-apprenticeship, building trades, and facility management program to train their workers. And the Career Pathways grant's flexibility gave Gila River the ability to fill in the financial gaps that were needed in the community such as tuition, mileage, and training. Not only was Gila River the first tribe to receive a Career Pathways grant, but it serves as inspiration for tribes and federal policy action.

2.3 Tribal Consultation and Representation

Consultation and representation are key components to ensuring an inclusive, equitable indigenous energy transition. Earlier I highlighted the challenges that tribes face in achieving energy sovereignty and workforce development. Some of these barriers can be attributed to the lack of native representation and consultation in decision making spaces like workforce development boards, utility authorities, and project development. In this section, I first discuss the need to fortify information infrastructure as it relates to the distribution of information and ability for tribes to engage in a meaningful and timely manner. Then, I review consultation practices by agency and factors leading to consultation failure. And finally, I examine how native representation plays a role in decision making for tribal nations and how federal agencies can improve.

2.31 Information Sharing and Infrastructure

According to a 2017 FCC report, almost one third of Americans living on tribal lands had limited or no access to the internet, which is more than 8 times higher than the rest of Americans (*Tribal Broadband: Status of Deployment and Federal Funding Programs*, 2019). With 32 percent of Americans unable to connect to the internet on tribal land, this has serious implications for the spread of information in all aspects of an individual's life. And this lack of information especially created challenges as seen during the COVID-19 pandemic. Not only did COVID-19 create a health crisis for indigenous communities, it created an information crisis. This meant that stay at home orders limited access to education for students, limited access to up-to-date health information that is especially vital in a pandemic, and finally, it limited economic opportunities like accessing unemployment resources.

Such issues are not only faced during a pandemic, but for any economic opportunity. This includes access to unemployment resources, access to knowledge about job opportunities, and access to continue working from home for those that still held a job. Furthermore, the lack of internet access made it difficult for community members to engage in the political and legislative process. In New Mexico, this was extremely problematic as policymakers continued to move forward with community feedback seminars for the Energy Transition Act at the beginning of the pandemic. Due to inadequate internet access and inability to travel more than 50 miles to the location of the feedback seminar, many indigenous people were unable to learn more about the ETA and give honest feedback.

And the lack of information also translates to energy development. Often indigenous communities are not included in the decision-making process or even consulted for energy projects that will affect cultural sites, tribes, or workers even if there are processes in place to ensure accountability which will be discussed in further detail momentarily. Therefore, I endorse Resources for the Future's recommendation to appropriate $35 billion over 10 years with the goal of expanding rural broadband across the country for tribal and rural communities (*Policy Options to Enable an Equitable Energy Transition*, 2021).

2.32 Federal Agency Consultation Current Practices

Within the federal government and its agencies, tribal consultation has a varied track record. Part of the reason can be attributed to the fact that tribal consultation is defined differently across the federal agencies. Agencies like BLM and DOI need to reevaluate their definitions for what tribal consultation looks significantly. On the other hand, agencies like the USDA and DOE set clear expectations for how employees and the agency are to carry out consultation. More importantly, tribal consultation definitions demonstrate that procedural justice for an energy transition must address how agencies approach and define their practices. Now I will walk through selected agencies' definitions and outline phrases that are continuing to perpetuate procedural injustices for indigenous people and phrases that properly address tribal concerns.

Bureau of Land Management

> Consultation is "the conduct of ***mutual, open, and direct two-way communication*** in good faith to secure meaningful and timely participation ***in the decision-making process, as allowed by law***" (Tribal Consultation: Additional Federal Actions Needed for Infrastructure Projects, 2019)

At first glance, BLM's consultation definition is short and to the point. Yet, as a third-party observer, there is very little information about how tribal consultation is conducted. While consultation is supposed to be "mutual, open, and direct two-way communication," it does not specify in any way what is defined as direct two-way communication. It also does not specify who communication can be or should be conducted with. And while it says that tribal consultation should be made during the decision-making process, it does not say at what stages this must occur.

Furthermore, it adds in the phrase "as allowed by the law." This is particularly worrisome from the perspective of an indigenous person. As discussed previously, land management laws have a long history of restricting the rights of indigenous people and preventing them from fully using their land to create economic opportunities. Instead, I recommend that the definition is changed as follows:

> **Proposed Bureau of Land Management Consultation Definition**
>
> "Consultation is the conduct of mutual, open, and direct two-way communication in good faith to secure meaningful and timely participation. Direct two-way communication is defined as [BLM to insert definition] with tribal leaders and members. Communication will be made through all processes of the decision-making process and be adjusted as BLM and the tribe see fit."

These changes are important to implement as soon as possible as BLM is the agency in charge of managing public lands for recreation, grazing, energy development, and other purposes.

Department of the Interior

> The basis of consultation is rooted in meaningful ***dialogue where the viewpoints of tribes and the Department of the Interior, including its bureaus and offices***, ***are shared, discussed, and analyzed. A consultation session is,*** but is not limited to, ***in-person meetings, video conferences, teleconferences, and correspondence to discuss a specific issue.*** In the case of in-person meetings, video conferences, and teleconferences, the consultation may be expanded upon through subsequent correspondence after consultation is initiated. On a case-by-case basis, consultation may be held through a series of written correspondence with the tribal leadership, but this process of utilizing written correspondence should only be used when other methods of dialogue are not feasible. (Tribal Consultation: Additional Federal Actions Needed for Infrastructure Projects, 2019)

Similarly, the Department of Interior's consultation is not completely inclusive, whether intentional or not, of tribal member viewpoints. The definition specifically calls out bureaus and offices, but for a transition to be fully inclusive, consultations need to include its members. It also says viewpoints should be "shared, discussed, and analyzed," but does not say whether it needs to be included. I recognize that not all viewpoints can be implemented in the final solution, but there are other outlets like highlighting feedback in reports that can serve as a way for all voices to be heard.

The DOI definition does spend a significant portion outlining methods of communication but does not prioritize in-person consultations or specify the inclusion of tribal members. This is particularly important as tribal nations often lack access to broadband, making public participation in legislation difficult. Moreover, the DOI consultation definition does not specify when communication with tribal leadership and tribal members need to be conducted. This is a crucial part of maintaining an equitable and inclusive transition. Therefore, I recommend it is written as follows:

Proposed Department of Interior Consultation Definition

"The basis of consultation is rooted in meaningful dialogue where the viewpoints of tribal leadership, tribal members, and the Department of the Interior, including its bureaus and offices, are shared, discussed, and analyzed. For input not included, the Department of Interior will specify why feedback was not incorporated. Initial consultation sessions should be conducted through in-person meetings or video conferenced consultation sessions. However, this is under the assumption that video conference consultations are used if a tribe has adequate internet connection. For any following correspondence, teleconferences and written correspondence can be used if agreed to by tribes in the initial session. Written correspondence with tribal leadership should only be used when other methods of dialogue are not feasible."

Department of Transportation

> Consultation "***refers to meaningful and timely discussion in an understandable language with tribal governments*** during the development of regulations, policies, programs, plans, or ***matters that significantly or uniquely affect federally recognized American Indian and Alaska Native tribes and their governments***." (Tribal Consultation: Additional Federal Actions Needed for Infrastructure Projects, 2019)

The Department of Transportation starts on the right note of requiring a "meaningful and timely" discussion. It goes one step farther to outline that tribal consultations should be conducted in an "understandable language with tribal governments" and is done through a series of steps. However, as it stands, tribal consultation does not include tribal members. It also says that it should be used for issues that "significantly or uniquely affect federally recognized" tribes, therefore not adequately incorporating procedural justice for an energy transition. Tribes are recognized as sovereign nations, therefore, tribal members and leaders deserve to be made aware and included in decision making related to projects that affect any of their members in any way. This definition can be improved as such:

Proposed Department of Transportation Consultation Definition

"Consultation refers to meaningful and timely discussion in an understandable language with tribal governments during the development of regulations, policies, programs, plans, and all matters that may potentially affect federally recognized American Indian and Alaska Native tribes, their governments, and their tribal members."

Department of Agriculture

> Tribal consultation is the ***timely, meaningful, and substantive dialogue*** between Department of Agriculture officials who have delegated authority to consult, ***and the official leadership of federally recognized Indian tribes, or their designated representative(s),*** pertaining to agency policies that may have tribal implications. It is also important to distinguish between consultation and other actions. ***Notification – the distribution of information from a Department of Agriculture office or agency to one or more tribes - is not consultation.*** Neither are technical communications or outreach activities, however important or influential, between staff without leadership involvement. While notification, technical communications and outreach are all essential, and are often used as part of consultation, they alone do not constitute government-to-government consultation. (Tribal Consultation: Additional Federal Actions Needed for Infrastructure Projects, 2019)

The Department of Agriculture's definition of tribal consultation is more aligned with procedural justice, stating the need to engage in "timely, meaningful, and substantive dialogue." USDA clearly states the need to converse with official tribal leadership and include "designated representatives" which address a different form of tribal governance structure. For a fully procedurally just definition, USDA could include tribal members. Additionally, USDA makes a distinct note that "notification…is not consultation" that was

missing from other definitions mentioned above. Tribes have noted their frustration with external actors in using notification as a way to consult. However, this is not the case.

Department of Energy

> Consultation: "***prior to taking any action with potential impact upon American Indian and Alaska Native nations***, providing for mutually agreed protocols for timely communication, coordination, cooperation, and collaboration to determine the impact on traditional and cultural ways of life, natural resources, treaty and other federally reserved rights ***involving appropriate tribal officials and representatives throughout the decision-making process, including final decision-making and action implementation*** as allowed by law, consistent with a government to government relationship." (Tribal Consultation: Additional Federal Actions Needed for Infrastructure Projects, 2019)

And finally, the Department of Energy goes a step further than previous definitions. Tribal consultation in DOE starts from the beginning before any action that might impact tribes. It also advocates for developing processes for "timely communication, coordination, cooperation, and collaboration." Consultation also includes "tribal officials and representatives" in decision making. More importantly, it specifies inclusion at the "final decision-making and action implementation." This definition adequately demonstrates what tribal consultation looks like and the fact that any relationship with tribes is on a government-to-government basis. The only recommendation I might add is for DOE to remove "as allowed by law" as there are still restrictions in place that might prevent tribes from carrying out any projects.

Moving forward, I urge agencies to review their tribal consultation definition and processes to incorporate some of this feedback. As seen, there are some agencies that better define tribal consultation. In reviewing and editing, I recommend leaders to reach out to tribal nations to better understand what they would like to see in future efforts. To view additional consultation definitions, I have included more in Appendix I. I hope the new administration gives agencies the ability and push needed to redefine their relationships with tribal nations. Because words do matter.

2.33 Federal Agency Consultation Areas of Improvement

Words matter, but actions are what counts. Tribal consultation definitions like DOE are models for agencies looking to improve their practices. However, following through on these statements is important too. A recent GAO report looked at federal agencies' track record with conducting tribal consultation. Based on interviews with 57 tribes and 21 agencies, tribes described several failures in consultation practices and a lack of respect for tribal sovereignty. Tribes indicated that agencies brought in tribal representatives late into projects and did not consider tribal input in decisions (*Tribal Consultation: Additional Federal Actions Needed for Infrastructure Projects*, 2019).

The consultation failures included bringing in tribal representatives late in project development, agencies did not consider input in decisions, and agencies not respecting tribal sovereignty (*Tribal Consultation: Additional Federal Actions Needed for Infrastructure Projects*, 2019). GAO found that 67 of 100 tribes reported late consultations to federal agencies and 22 tribes said that agencies do not update tribes after

consulting them. GAO identified that difficulty in maintaining up to date contact information, lack of financial resources, and trouble coordinating projects were factors that contributed to poor tribal consultation.

Interestingly, there is a difference in agencies that have policies in place to implement tribal input. The five agencies that did have policies were BLM, EPA, FAA, the Forest Service, and NOAA. Those that did not included DOE, HUD, FCC, FEMA, and Rural Development. You might notice that while BLM's definition for consultation was poor, it was one of the few agencies that had policy addressing tribal input, whereas DOE did not. To see the other agencies with poor tribal consultation policies, see Figure 14.

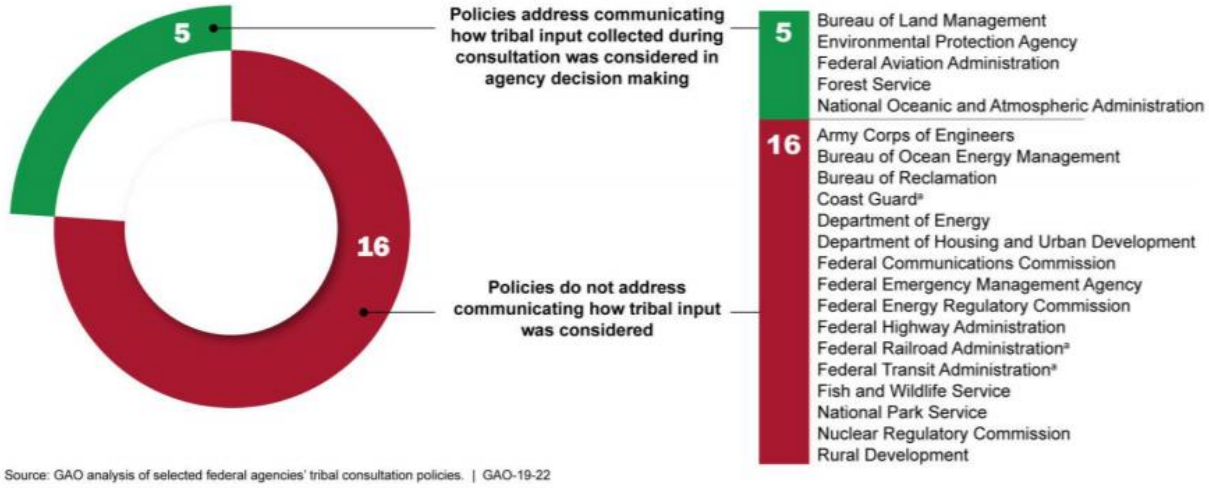

*Figure 14: GAO analysis of selected federal agencies tribal consultation policies (*Tribal Consultation: Additional Federal Actions Needed for Infrastructure Projects, *2019)*

While GAO highlighted which agencies planned to update their policies, enforcement at a higher level is required. This will hopefully be addressed with President Biden's recent Presidential Memorandum on Tribal Consultation and Strengthening Nation to Nation Relationship. The release required agencies to consult and create a plan of action in developing federal policies that affect tribal nations on the grounds of the National Historic Preservation Act (NHPA). This applies to infrastructure policies including any "ground disturbing activities" like pipelines and projects which are funded in whole or in part by a federal agency (*Tribal Consultation: Additional Federal Actions Needed for Infrastructure Projects*, 2019). Yet, GAO identified consultation practices that proved to help with tribal engagement and relationship building. For instance, the Bureau of Ocean Management has a tribal liaison position dedicated to attending tribal engagement. Another useful method was meeting regularly outside of planned consultation sessions, increasing relationships with tribes. Forming memorandums of understandings for communication and engagement processes also proved to be useful and carried out by thirteen agencies. And finally, maintaining two ways of communication, meaning that agencies updated tribes on the status of a project and how their input was used.

With an energy justice driven transition, it is important to recognize that indigenous people require respect as it pertains to land management, economic development, and energy development. Decisions that potentially affect tribes in any way should be communal and find consensus among tribal membership.

Consensus should not only be carried out through and with tribal government but through and with its tribal members as well.

2.34 Tribal Nations & Representation in Energy Decision Making

Up to this point, I have focused on tribal consultation practices for many agencies. In this section, I will focus on how tribal nations interact and are represented in energy project development.

As mentioned earlier, the ITEDSA created the TERA process in 2005, to give tribes the ability to have more control over energy projects. If tribes were granted a TERA, which required the approval of the Secretary of the Interior, then tribes could enter into energy leases and business agreements without going through the process again. But this process ended up being used against tribes during the Trump administration in which the Secretary of the Interior made a list of activities that would not allow tribes to use the TERA process. In discussing the situation in the energy sovereignty section, I focused on the issues related to tribal independence. However, from a tribal consultation and representation perspective, this process proves the risk of being procedurally unjust because TERAs treat tribes in a condescending manner and not like the sovereign nations that they are.

Thankfully, leaders like Deb Haaland now run the Department of Interior and can prevent this from happening in the future. Yet, if policymakers are to push for an inclusive, equitable energy transition, the federal government needs to increase native representation throughout all agents of power. To date, there are two channels that the President and the federal government is trying to use, specifically for energy projects. This includes the Interagency White House Council on Native American Affairs' Energy Subgroup and the Interior's Indian Energy Service Center (*Indian Energy Development Additional Actions by Federal Agencies Are Needed to Overcome Factors Hindering Development*, 2016).

Created in 2013, the Interagency White House Council on Native American Affairs' Energy Subgroup aimed to "improve coordination of Federal programs and the use of resources available to tribal communities" to promote sustainable economic development in energy, transportation, housing, workforce development, and other infrastructure (The White House Office of the Press Secretary, 2013). To do this, President Obama declared that funding would be given to the Department of Interior and filled with members from other agencies (*Indian Energy Development Additional Actions by Federal Agencies Are Needed to Overcome Factors Hindering Development*, 2016). However, this staffing model made it hard to maintain continued participation and engagement because staff and dedicated funding were limited. This prevented the Energy Subgroup from making its five-year strategic plan as outlined. Therefore, $1 million should be allocated to the Department of Interior to hire full time staff dedicated to Energy Subgroup activities.

As for the Interior's Indian Energy Service Center (IESC), it was designed to be a "multi-agency collaboration between BIA, BLM, ONRR, and BTFA … to expedite Indian oil and gas activities, standardize processes, and provide for multi-disciplinary engagement" (*Indian Energy Service Center | Indian Affairs*, n.d.). The Center was able to address some of the project backlog that had long been touched, but the Center still has not developed a monitoring process to evaluate energy project development.

Chapter 3: A State Perspective: New Mexico

"For nearly a century as this story relays, the Navajo Nation's economy has been dependent on intensive extraction of energy minerals, especially oil, uranium, and coal, while the household energy needs of many Dine families on the reservation remain unmet" (Powell, Dana, 2018). In Powell's depiction of the Navajo's experience, she describes similar experiences with other tribal nations around the country. I hope to provide insight to a state's actions and how its clean energy goals will impact indigenous people.

New Mexico and tribes have a history that intertwines with the fossil fuel industry. Oil, gas, and coal have long provided an economic foundation for tribal communities, employment opportunities, and a source of revenue that funds the public school system and state services. Yet, recent efforts aim to pull back emissions in the state. For example, Governor Richardson, former governor of New Mexico (2003-2011), set goals to make New Mexico a renewable energy export leader, lead in Greed Grid innovation, lead in building and energy efficiency, and develop an education system that prepares workers for green jobs (*Governor Bill Richardson Sets Bold Agenda for Future of New Mexico's Green Economy*, 2010).

Today, New Mexico's current Governor, Michelle Lujan Grisham is pushing the state towards clean electricity with passage of the Energy Transition Act in 2019. The Energy Transition Act (ETA) sets the following targets for carbon emission reduction:

- 50% of electricity generation from renewable energy by 2030
- 80% of electricity generation from renewables by 2040
- 100% carbon free electricity generation by 2045

The ETA goals put New Mexico alongside 28 other states to adopt clean energy standards (Lashof & Bird, 2019). These goals will force drastic changes to the state's energy system, technology, and communities in the next couple of decades. But at the same time, decarbonization policy poses the risk of perpetuating the historical economic, social, and environmental harm that indigenous communities have faced. In order to adequately prepare for a transition, policymakers need to assess the current energy system and its policy landscape with an explicit eye towards energy justice.

In Chapter 3, I examine the current tribal energy and workforce landscape in New Mexico, highlighting areas that policymakers will need to address in designing an equitable energy transition for indigenous people. I supplement these findings with case studies of past tribal energy projects. Here, I aim to give clear examples of how indigenous people continue to endure an unjust energy system and how past accounts can be addressed through future policy. This analysis draws on findings from an in-depth review of past tribal energy projects reports and strategic energy plans.

It is important to note that each pueblo and tribe in New Mexico have their own unique culture, history, energy resources, and energy development story. Therefore, any highlighted challenges and recommendations are made with the understanding that it may not apply to all tribes. Instead, I aim to take the approach that members of the Acoma Pueblo used and try to give "a scan of the environment…as it currently exists – shaped by the history of the work, people, community and their impact on the consciousness and readiness of the Pueblo to undertake planning" (Indigenous Collaboration, 2018).

3.1 Tribal and Energy Landscape

In New Mexico, there is a significant indigenous population. In 2018, over 190,000 individuals self-identified as American Indian, translating to 9.6 percent of the population (Headwaters Economics, 2020). Within the state, there are 23 tribes, which is made up of 19 pueblos, three Apache tribes and the Navajo Nation. Each is a sovereign nation meaning these tribal nations have their own government, procedures, and laws within their borders. The 23 nations are concentrated in the central and northwestern region of the state, although Mescalero Apache Tribe and Ysleta del Sur pueblos are located in the southern region. New Mexico holds the third largest acre of indigenous land, after Alaska and Arizona, with a total of 8.5 million acres (*Energy Development Impact on Indigenous Peoples*, 2017). This is a staggering 11 percent part of the state's land.

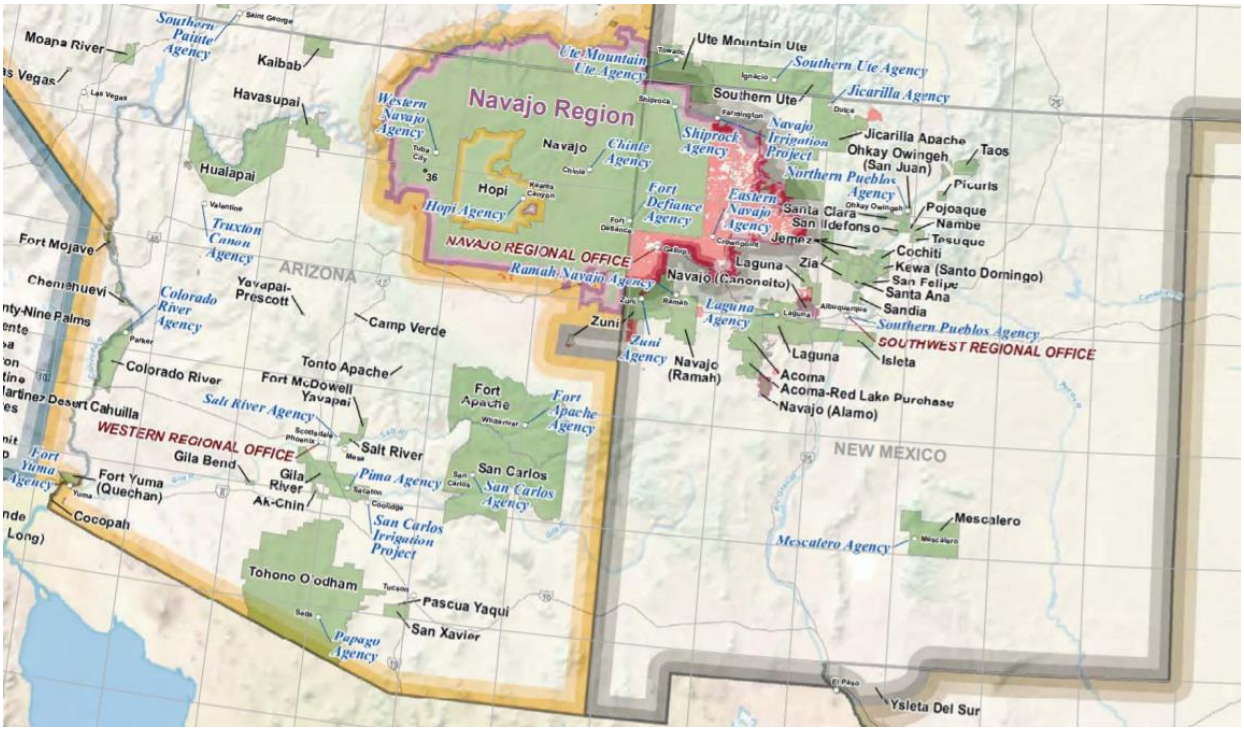

Figure 15: Map of tribal nations in Arizona and New Mexico. Image from: (Map of Indian Lands in the United States, n.d.)

3.11 New Mexico Tribal Fossil Fuel Landscape

New Mexico is home to substantial fossil fuel energy production. According to EIA, New Mexico is the nation's third largest oil producing state and one of the top ten natural gas producing states (*New Mexico - State Energy Profile Overview - U.S. Energy Information Administration (EIA)*, n.d.). It has large energy reserves with 5 percent of natural gas, 2 percent of recoverable coal, and the second largest uranium reserves. The EIA reports there are 120 active power plants across the state with a total installed capacity of 9,400 MW. The Four Corners region is home to the two biggest power plants, the Four Corners and San Juan power plants. It also is home to the Navajo Nation, in which tribal members are twice as likely to live

within a half of a mile from an oil and gas site than New Mexico residents (*Impacts of Oil and Gas Drilling on Indigenous Communities*, n.d.).

In addition, New Mexico and some tribes rely on fossil fuels for employment and revenue to provide services for their communities. For instance, state administrators created a permanent fund from severance tax revenues to help with a period of economic instability in the 1980s. That fund is estimated to make up one third of the state's general fund which provides money to the public school system, universities, and state agencies (Montoya Bryan, 2020). However, tribal nations only get so much funding from the state. Some tribes and pueblos in New Mexico are more reliant on fossil fuels for employment as well as royalty payments and taxes to fund government activities. For example, when the 2,250 MW Navajo Generating Station in Arizona and the Kayenta coal mine closed, the Navajo Nation lost of more than 3,000 jobs, $500 million in Gross Navajo Nation Product, and $240 million in income (Use of the San Juan Generating Station to Develop Metrics to Compare Coal Fueled Power Plant Jobs Impacts to Those of Renewables, 2020). With the possibility of the San Juan Generating Station closing, an estimated 1,600 jobs would be lost as well as over $67 million in tax revenues (O'Donnell, Kelly, 2019). This will impact not only San Juan county but also San Juan College and Central Consolidated School. As seen in Table 5 below, indigenous people will particularly be affected as 90 percent of students at Central Consolidated School District identify as Native American and are estimated to lose 50 percent in property tax revenues with SJGS closing.

Table 5: Financial Impact of San Juan Generating Station on various actors (O'Donnell, Kelly, 2019)

Impact of San Juan Generating Station and Mine on Annual Property Tax and Revenue

	Property Tax Revenue	Total Property Tax Revenue	Percentage of Property Tax Revenue
San Juan County	$ 3,184,207	$ 78,265,875	4.10%
Central Consolidated School District	$ 3,489,891	$ 7,193,326	49%
San Juan Community College	$ 1,910,524	$ 16,672,146	11%

It should be noted that while PNM announced closure of the 847 MW San Juan Generating Station in 2022, there recently was a memorandum of understanding formed between Enchant Energy, San Juan College, and the city of Farmington to implement a carbon capture and storage device on the existing plant. This would allow the plant to stay open longer and slowdown worker downsizing. Additionally, the project would give San Juan College the opportunity to integrate it into the energy technician curriculum and train students on how to operate and maintain CCUS systems (San Juan College, 2020).

3.12 New Mexico Renewable Landscape

Simultaneously, New Mexico holds enormous potential for renewable energy technologies. Already, wind energy accounts for over 20 percent of the state's electricity generation. New Mexico is rated eleventh in the US for wind potential and third in the country for the best solar resource. However, only 2.8 percent of total electricity consumption came from solar in 2016 ("Solar Power in New Mexico," 2021). There are more renewable projects in the pipeline across the state and on tribal land. One upcoming project is a 50 MW utility solar array being built on the Jicarilla Apache nation with planned operation in 2021. This will

be the third largest solar project on a tribal nation in the country and serve as another model for indigenous people around the country who are pushing for more renewable energy.

Yet, there is significant work to be done in order to scale up tribal energy projects. Tribal energy development in New Mexico is largely funded and supported by the federal government through the Department of Energy Tribal Energy Program (TEP). To date, there have been 20 tribal renewable energy projects completed resulting in less than 3 MW of power since 1994 (*Tribal Energy Projects Database*, n.d.) (*Archived Tribal Energy Projects Database*, n.d.). Of those projects funded, 9 projects were solar, 6 general renewable energy projects, 2 energy efficiency, 1 hydropower, 1 wind, and 1 geothermal. These projects widely varied in the scope and the project timeline.

Most DOE funded projects in New Mexico were feasibility studies aimed to identify potential renewable resources available to the tribe and flag any barriers that tribes might face. There were 12 feasibility studies, 2 projects were in the planning stages and 6 projects that deployed energy technologies. In total, DOE gave close to $6 million in funds, one-third of which supported two projects for the Picuris Pueblo. Combined with matched funds from tribes, a total of $9,905,148 went to tribal energy projects. In New Mexico, these funds have increased over time (see Appendix II for the complete list of DOE TEP New Mexico projects). This is due to the move from feasibility studies to deployment of energy projects.

In looking in more detail at projects funded at the feasibility and planning stages, Figure 16 gives a more visualized view of the types of clean energy technologies funded, the amount of funding given by actors, and the awarded tribe or pueblo. Funds given by DOE are marked along the x-axis and funds matched by tries are on the y-axis. As one might notice, most projects are concentrated with DOE funding landing in the $100,000 to $200,000 range. For many projects, DOE funding exceed that provided by the tribes signaling the importance of government funds for feasibility studies[5].

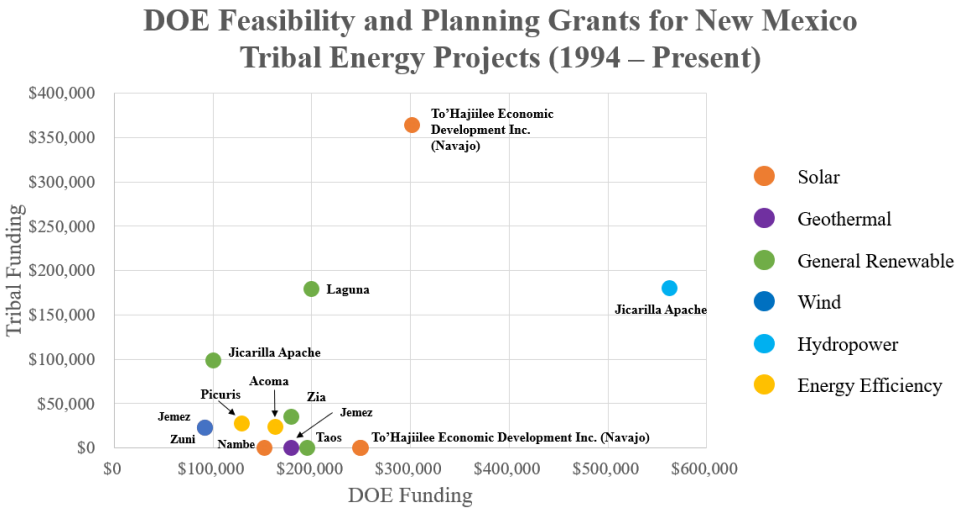

*Figure 16: DOE Feasibility and Planning Grants for New Mexico Tribal Energy Projects. Data from: (*Tribal Energy Projects Database, *n.d.) (*Archived Tribal Energy Projects Database, *n.d.)*

[5] There is one case in which a tribes contribution surpasses DOE, a solar project for the To'Hajiilee Economic Development Inc. from the Navajo Nation.

As for deployed federally funded projects, the landscape is much smaller. Since 1994, there have been 6 projects partially funded by the DOE. The first deployed project was in 1995 when the Jicarilla Apache nation installed a 2.4 kW photovoltaic installation at Dulce High School (*Jicarilla Apache Nation - 1995 Project*, n.d.). The goal of this demonstration project was to educate Dulce school students, teachers, and Jicarilla Apache tribal members to learn about renewable energy. Funding included the costs of the panels as well as educational materials and training for teachers and students.

Next, the Laguna Pueblo installed 8.1 kW photovoltaic and wind system to replace old water windmills in 1999 (*Pueblo of Laguna - 1999 Project*, n.d.). The system also included a solar hot water system and drinking water system for the 20,000-acre Majors Ranch used to raise livestock. Photovoltaic panels and hot water systems were installed by Sacred Power, a native owned solar company.

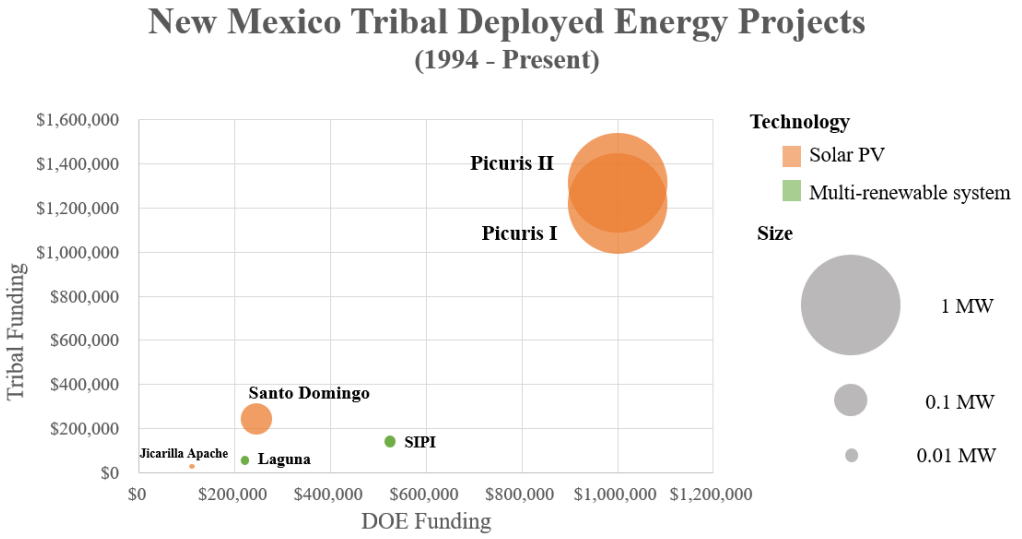

*Figure 17: New Mexico Tribal Deployed Energy Projects. Data from:(*Tribal Energy Projects Database, *n.d.)* *(*Archived Tribal Energy Projects Database, *n.d.)*

In 2000, the Southwestern Indian Polytechnic Institute (SIPI) installed a number of renewable energy projects in order to prepare students on energy technologies and promote clean energy use on campus (*Southwestern Indian Polytechnic Institute - 2000 Project*, n.d.). Technologies installed included a 1 kW wind turbine, 10 kW PV array, 1 kW PV mobile hybrid system, 1.2 kW PV off-grid array, hot air system, solar hot water system, and more (*Feasibility Study for Photovoltaics, Wind, Solar Hot Water for ON/OFF Grid-Connected Power to SIPI Campus*, 2007). SIPI is a two-year education institution, supported by the Bureau of Indian Affairs that serves 650 students per trimester. The installation and education materials aimed to give students experiential learning experience for SIPI's electronics technology, environmental science, agricultural science and natural resources certificate and degree programs.

Then 15 years later, the Santo Domingo tribe received $245,382 to implement a PV system that would power the community's water pump and treatment facility (*Santo Domingo Tribe – 2015 Project*, n.d.). The project would save the tribe $20,000 in electricity costs and allow Santo Domingo to pay off the system within 6 years. Additionally, the system would reduce Santo Domingo's fossil fuel electricity consumption

by 77 percent, resulting in 2.4 million lbs per year of avoided carbon emissions (*PV Solar Power for the Santo Domingo Tribe's Community Water Pump and Treatment Facility*, 2019).

And finally, this leads us to the Pueblo of Picuris – a tribe that deployed the largest federally funded energy project in New Mexico. This was conducted in two separate DOE grants in 2016 and 2018. The projects resulted in two 1 MW solar plants that supported the pueblos general electricity. Details of this particular project will be explored in greater depth in section 3.2 on workforce development.

TEP projects have the potential to deploy clean energy on tribal lands as well as connect tribal leaders to technical experts for feasibility studies and other technical support. However, funding for these projects is very small and only has served 10 of the 23 tribes within New Mexico. As I noted, DOE should dedicate funding to any tribe that has not been served through the Tribal Energy Program. Additionally, DOE should increase funding to meet the needs of tribes more adequately. And such funding needs to be more than the $3 million in funds the Central Consolidated School District would lose if SJGS closes, is half of all funding given to tribes in New Mexico for energy projects.

At the state level, I recommend policymakers also increase funding for tribal energy projects. Therefore, I recommend that New Mexico update its HB0868 bill, to increase funding to the Tribal Infrastructure Act. Previously, the bill called for "five percent of the project fund or five hundred thousand dollars ($500,000) is appropriated from the project fund to the Indian affairs department" (2005 House Bill for HB0868, 2005). However, to increase the number of tribal energy infrastructure projects, I recommend funding is increased to at least $2 million per year for 10 years. This will allow tribes to continue to build transmission lines to serve their communities as well as provide funds for energy efficiency projects. For states, that do not have a dedicated fund for tribal infrastructure projects, I urge state governments to implement one.

Additionally, New Mexico should consider dedicating a portion of funds to support tribes that experienced financial hardship due to the energy transition if carbon pricing or cap-and-trade policies are implemented *(International Carbon Action Partnership, 2021) (Senate Climate Report, feedback from tribal leaders).* Since the tribal carve out would be dependent on pricing and other factors, I encourage policymakers to keep this in mind for the future.

Aside from the increased funding, I recommend that policymakers create policies that improve energy development support services for tribes, promote tribal energy sovereignty through the creation of utility authorities, and encourage tribes to increase energy efficiency projects. To illustrate areas of support policymakers can influence, I draw in the experience of two tribes (Santo Domingo and Jicarilla Apache) in New Mexico and raise the various challenges they faced.

Case Study: Santo Domingo Pueblo

As mentioned earlier, the Santo Domingo implemented a PV system in 2015 through DOE's Tribal Energy Program. The project was successful in reducing consumption from fossil fuels by 77 percent, preventing 2.4 million lbs. of emissions per year, and saving the tribe $20,000. Yet, there is an important lesson to draw from this case: create a supportive and flexible process for future tribal energy projects (*PV Solar Power for the Santo Domingo Tribe's Community Water Pump and Treatment Facility*, 2019).

For background, the Santo Domingo is recognized as the fifth largest pueblo in New Mexico with 5,027 recognized residents (*Santo Domingo Tribe – 2015 Project*, n.d.). The pueblo is known for sticking to traditional values and have refused to use casinos as a source of economic development. Instead, Santo Domingo residents rely on the tribe's gas station and sand and gravel leases for revenue as well as struggle with poverty and unemployment. In 2012, 45 percent of the tribe lived below the national poverty level and had an unemployment rate of 41 percent (*Santo Domingo Tribe – 2015 Project*, n.d.).

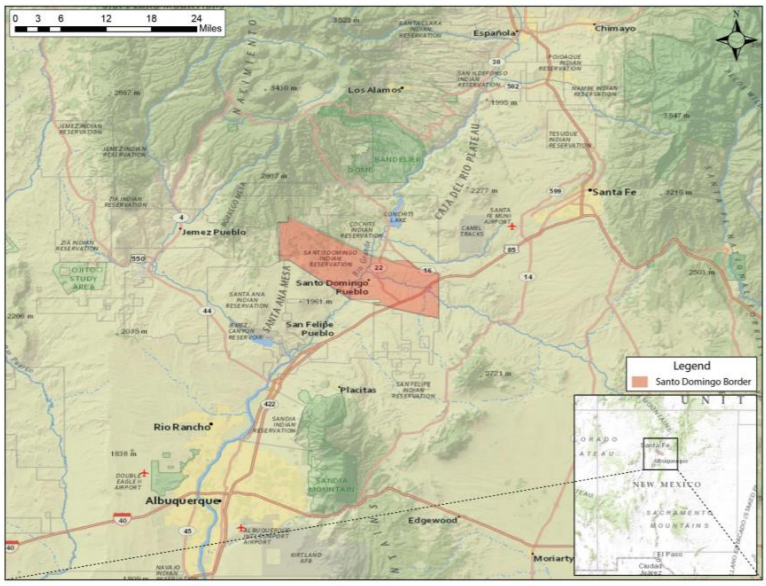

Figure 18: Map of Santo Domingo Pueblo and surrounding infrastructure (Young & Lee, 2016)

Fortunately, the Santo Domingo is well positioned for energy development as they have access to 800 acres of trust land with good solar energy potential and have major power lines running through it (*Santo Domingo Tribe – 2015 Project*, n.d.). To become familiar with solar technology and the bureaucratic processes, Santo Domingo decided to pursue the small-scale solar project. This would not only reduce emissions and provide economic benefits to the tribe but train tribal officials and the community for future initiatives. Santo Domingo was successful in getting many offers from developers and in the end picked Affordable Solar, who had the lowest price with best determined likelihood of completing the project on time.

While Santo Domingo implemented the project successfully, there were some bumps along the way. A bad monsoon season brought an uncontrollable delay causing the system to go offline temporarily (*PV Solar Power for the Santo Domingo Tribe's Community Water Pump and Treatment Facility*, 2019). Yet, there were some unforeseen factors, which could have been avoided. In the final DOE report, the project participants noted that the project experienced significant delays due to staff turnover. The Santo Domingo insisted on the need for DOE to put in a process that could handle staff shifts and train incoming staff. Recommendations included making sure that replacement staff have all the tools needed for success – not only knowledge of where their former colleague left off but the same foundation of technical understanding.

The tribe noted that these project management challenges will force them to change how they approach knowledge building. For instance, Santo Domingo said they plan on developing a "Renewable Energy Team made up of staff and community members interested in developing and increasing the tribe's

capacity" (*PV Solar Power for the Santo Domingo Tribe's Community Water Pump and Treatment Facility*, 2019). This future team will not only give several members the training needed for project development but ensure that projects push forward with similar understanding instead of starting from nothing.

Case Study: Jicarilla Apache Tribe

Another insightful case that policymakers can learn from is the Jicarilla Apache, located in the northern region of New Mexico. For background, the Jicarilla Apache's tribal enrollment was estimated to be 3,400 with 990 of those members living off the reservation as of 2002 (Rabago, Karl, 2008). The majority of tribal members live in Dulce, New Mexico, where 25.4 percent of the population lives in poverty (*Dulce, NM | Data USA*, n.d.). For a long time, the tribe had little control over its electricity and experienced incredibly high electricity rates despite its large renewable energy potential and active oil and gas projects on its tribal land (*Jicarilla Apache Nation - 1995 Project*, n.d.).

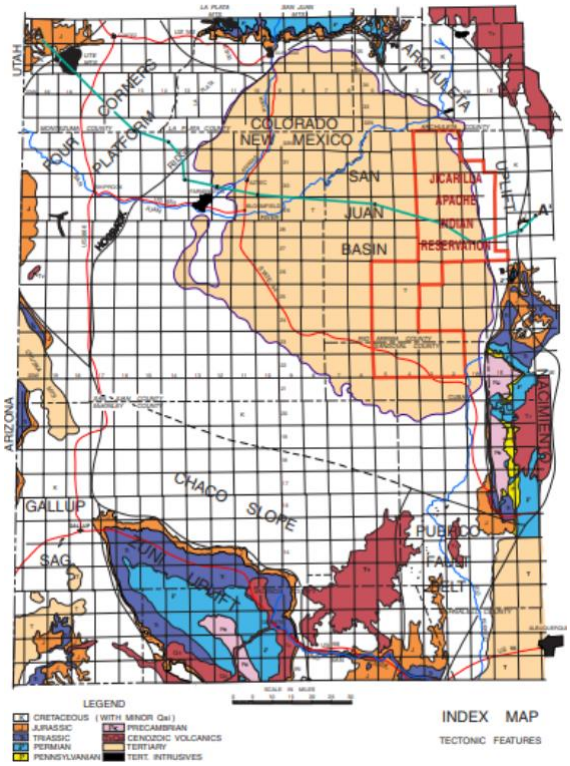

*Figure 19: San Juan Basin map (*Jicarilla Apache Reservation Oil and Gas Plays, *n.d.)*

The tribe sits on one million acres of the San Juan Basin, which contains the second largest natural gas field in the lower 48 states (*Jicarilla Apache Reservation Oil and Gas Plays*, n.d.). Aside from the federal government, the Jicarilla Apache are the largest mineral owners in the basin. On the reservation, oil and gas development is managed by the Jicarilla Oil and Gas Administration and managed according to the tribe's Title 18 Oil and Gas codes (*JOAGA Title 18: Oil and Gas*, n.d.). The administration manages activities including strategic energy planning, mineral development agreements, oil and gas planning, operating permits, BLM inspection and enforcement and more. There are about 2,500 wells which at one point produced 6,000 barrels per day on the reservation (*JAECO Oil Processing Program*, n.d.).

Despite their large resource and production activities, members of the tribe have not benefited as much as they could have from production. The lack of local refineries prevented the tribe from processing their own crude oil and therefore forced the tribe to pay full price for products refined. Additionally, the reservation was serviced by two member-owned electric cooperatives for years. The Northern Rio Arriba Electric Cooperative (NORA) serves the northern part of Jicarilla Apache, where most of its customers are farms, residences, businesses, and government buildings (Rabago, Karl, 2008). In the south, Jemez Mountains Electric Cooperatives serves the reservation and mostly oil and gas wells as well as compressor station loads. As for where the power came from, both NORA and Jemez source it from the Plains Electric Generation and Transmission Corporation in Denver.

Although in 2016, the Jicarilla Apache decided it wanted to be more in charge of their generation and developed their own utility authority. Along with forming the utility, Jicarilla Apache made an agreement with the Jemez Coop so that Jicarilla could serve the southern region (*Jicarilla Apache Power Authority*, n.d.). To date, Jicarilla Apache serves over 1500 customers and owns 300 miles of transmission lines.

The creation of the utility and desire to increase renewable energy in the nation led the Jicarilla to the development of an upcoming 50 MW solar array in partnership with PNM. This will be the third largest utility scale solar project on a tribal nation (Montoya Bryan, 2020). The project is estimated to cost $60 million to build and will provide power for Western New Mexico University, Deming Public Schools, 50 percent of Albuquerque's city government, and the tribe (*NEW SOLAR ENERGY PROJECT SET TO BE BUILT ON JICARILLA APACHE NATION LAND*, n.d.). It is also expected to provide the Jicarilla Apache nation with $1.5 million in lease payments for project land use.

The project is a rare case of a tribe and utility working together to build out solar projects without government funding as many projects have been funded through the Department of Energy's Tribal Energy Program. The possibility and success of the utility solar project is owed to the fact that the Jicarilla Apache tribe used its own money to build a substation and transmission line (*Long Tied to Fossil Fuels, Native American Tribes Seek Renewable Future*, n.d.). The project also allowed PNM to avoid additional costs it would not normally take on. For instance, PNM did not have to pay property taxes on the project, as the project was deployed on federally recognized tribal lands, meaning it was subject to tax and governance laws determined by the tribe.

While the project will provide the tribal nation with some revenue and the covered upfront capital costs, an outside developer is installing the plant. There is no information on whether Hecate will be providing job opportunities for the tribe (*Hecate Energy - News*, 2019). Hecate Energy is planning to build, own, and manage the 50 MW plant. This will be the first of two 50 MW on the reservation. Upon starting commercial operations in 2021, Hecate Energy is building another 50 MW solar plant and 20 MW battery storage (Montoya Bryan, 2020).

In addition, Jicarilla Apache evaluated current electricity demand and identified other clean energy opportunities through a DOE funded feasibility study (Rabago, Karl, 2008). The number one clean energy opportunity for the Jicarilla Apache was energy efficiency. By improving HVAC systems, building insulation, weatherizing, and installing LED lights, the Jicarilla can lower electricity costs and use for customers. Additionally, by improving the more than 1476 structures that range anywhere from 20 year to

70 years old, the Jicarilla Apache Nation can spur job and economic growth. The study also identified building out solar projects to take advantage of the Jicarilla's high solar resource. However, there are barriers that stand in the way including initial cost, financing, intermittent resource, and connecting projects to the grid.

Table 6: Jicarilla Renewable Energy Option Matrix (Rabago, Karl, 2008)

	Resource Quality	Cost per Unit of Energy Benefit	Local Labor Capacity to Develop the Resource	Individual Economic Benefits	Tribal Economic Benefits	Durability and Reliability	Potential for Expansion into a Business for the Region
Energy Efficiency (Residential)	High	Low	Good	High	High	High	Moderate
Energy Efficiency (Commercial)	High	Low	Good	N/A	High	High	High
Solar Electric (Large)	High	High	Low	Low	Low	Moderate	Low
Solar Electric (Small)	High	High	Good	High	High	High	Moderate
Solar Hot Water	High	Mod-High	Good	High	High	High	High
Wind (Large)	Low	Moderate	Low	Low	Low	High	Low
Wind (Small)	Moderate	Moderate	Moderate	Moderate	Moderate	High	Low
Geothermal (Large)	Unknown	Unknown	Low	Low	Unknown	High	Low
Geothermal (Small)	Fair	Moderate	Moderate	Moderate	Moderate	High	Moderate
Biomass Pellets	High	Low	High	High	High	High	High
Biodiesel	Poor	Moderate	N/A	Low	Low	Moderate	Low
Micro-Hydropower	Good	Low	Moderate	Low	Low	High	Low-Moderate

Challenges like upfront capital costs and insufficient technical support can be addressed with federal and state policy. However, to address, tribes and pueblos need more support for clean energy projects. The All Pueblo Council of Governor's, a council made up from tribal leaders from New Mexico's 19 pueblos, states that community solar "will offer Pueblo Nations energy sovereignty, reduced energy burdens for Pueblo families and increase economic development and job opportunities" (All Pueblo Council of Governors, 2021). However, there is sometimes pushback from utilities about implementing community solar projects on tribal land. Therefore, I recommend that New Mexico and other states mandate rural electric coops to allow community solar projects on tribal land.

3.2 New Mexico Workforce Development

As mentioned in Chapter 2, there are several barriers in building an indigenous energy workforce, but my discussions and recommendations were at a national level. To look more in depth at what is going on at the state level, I will give insight into New Mexico's workforce. First, I will give an overall picture of the what

the energy workforce looks like overall in New Mexico. Then, I will proceed to look at the indigenous energy workforce to highlight challenges that are specific to New Mexico tribes and pueblos. This will lead me to make recommendations on how the state can improve the indigenous workers to transition to clean energy.

3.21 New Mexico's Energy Workforce

According to the 2020 U.S. Energy and Employment report, there are over 50,000 energy workers in New Mexico (*New Mexico: Energy and Employment 2020*, 2020). This represents more than 5 percent of employment in the state, which is much higher than the national average of 2.3 percent. Of the total energy workforce, 44,112 workers are traditional energy, made up of the fuels sector, electric power generation, and transmission, distribution, and storage. The remaining energy workforce is in energy efficiency, which has 6,099 individuals. As for job growth, between 2018 and 2019, electric power generation, fuels and transmission, distribution and storage together added 9.7 percent more jobs while energy efficiency added 8.2 percent. Table 7 breaks down total jobs in the state by sector, what counties employ the most workers, projected growth, and hiring difficulty.

Table 7: Employment status and prospects in major energy-related industries in New Mexico

Industry	Fuels	Electric Power Generation	Transmission, Distribution & Storage	Energy Efficiency	Motor Vehicles
Total Jobs by Sector (*New Mexico: Energy and Employment 2020*, 2020)	25,123	5,321	13,668	6,099	7,882
Top Three Highest Employment Counties (*US Energy and Employment Report: 2017 County Level Data*, 2017)	Lea Eddy San Juan	Bernalillo Santa Fe McKinley	Bernalillo San Juan Lea	Bernalillo Doña Ana Santa Fe	Bernalillo San Juan Doña Ana
NM Projected Growth (*New Mexico: Energy and Employment 2020*, 2020)	6.9%	9.1%	3.3%	8.5%	2.0%
Hiring Difficulty (*New Mexico: Energy and Employment 2020*, 2020)	37.5% Very difficult	25% Very difficult	60% Somewhat difficult	66.7% Somewhat difficult	66.7% Difficult

Unfortunately, the US Energy and Employment report (USEER) does not offer any information of what the state workforce looks like by demographic, but we can gain sight into what the indigenous workforce looks like by looking at the county level. For instance, USEER provides employment by county for the 2017. Using the "Top Three Highest Employment Counties" and county demographic information, I give some insight into what sectors indigenous workers will be most affected by.

Fuels

Fuels is the largest employer in New Mexico's energy sector, made up of 25,123 workers (*New Mexico: Energy and Employment 2020*, 2020). In terms of fuel source, oil and petroleum employs 15,000 workers and natural gas employs 8,500 workers. And if we look at the type of work being done in fuels, the majority of workers are involved in mining and extraction (87 percent). But geographically, where are these jobs located? The top three counties with fuels employment are in San Juan, Lea, and Eddy counties. While most of the population in Lea and Eddy county identify as white, 39.6 percent of San Juan county is Native American. San Juan county is also where a large area of the Navajo Nation resides and home to the San Juan Generating Station (SJGS), which is scheduled to close in 2022, displacing an estimated 450 workers.

Not only will the plant shutdown force workers to find another job, but it takes away a high salary industry position that provides funds to support families. The US median hourly wage for mining and extraction for energy workers is $36.32, which is 90 percent above the overall national median wage (*USEER: Wages, Benefits, and Change*, 2021). This is significantly higher than the median wage for San Juan county of $22.59 (*ESDWAGOV - San Juan County Profile*, n.d.). And on top of it all, it takes away healthcare benefits and the pride shared by workers.

The high concentration of energy workers in fossil fuels will need to be reckoned with as renewables are typically less workforce intensive compared to fossil fuels. Some tribes will be more affected than others. In 2017, one study estimated that 3.6 percent of Jicarilla's Apache tribal members are employed by mining and 3.4 percent for the Navajo Nation. While this does not seem high, the percent of the population that will be affected by the change to fossil fuels is higher than the state's population of 1.9 percent (*Energy Development Impact on Indigenous Peoples*, 2017).

Electric Power Generation

Solar covers most of EPG employment in New Mexico with 3,370 workers (*New Mexico: Energy and Employment 2020*, 2020). This is more than twice the number of workers involved in wind energy technologies. As for where the state experiences the highest EPG employment, it occurs in Bernalillo, Santa Fe, and McKinley. Like San Juan, McKinley has a large native population, with a reported 76.7 percent identifying as Native American (Headwaters Economics, 2020).

In terms of employment by industry, manufacturing and construction employ the most workers, totaling to 28 percent and 25.8 percent of the workforce, respectively. This is a significantly different industry profile compared to the fuels sector which is primarily mining and extraction. This will influence how well and what workers are able to experience a smooth energy transition as well as which workers will need to be supported (*USEER: Wages, Benefits, and Change*, 2021).

With Biden's new declaration of getting the US to net zero by 2035, fossil fuel workers are worried for what this means for them. Typically fossil fuel workers in electric generation have higher skill transferability compared to those in the fuels sector, but those in mining and extraction might need more training and resources in the future (Foster et al., 2020). And while workers in mining and extraction will be disappointed at their lower wages, median wages within construction and manufacturing for clean energy are still above the national median average (*USEER: Wages, Benefits, and Change*, 2021).

Additionally, fossil fuel workers in New Mexico are in rural areas, causing concern that they will not have access to clean energy jobs as found in a survey conducted by the University of New Mexico. The report found that individuals living outside of metropolitan regions were worried that all clean energy jobs would be given those living in Santa Fe and Albuquerque (*New Mexico Clean Energy Workforce Development Study*, 2020). However, unions across the building trades have found that there is difficulty in finding workers to install and maintain clean energy technologies in rural areas (Foster et al., 2020). This opens the possibility of greater opportunities to connect interest in construction and technology maintenance for clean energy technologies that are installed in the outlying counties.

Transmission Distribution and Storage

TDS employs 13,660 workers in New Mexico with 44 percent of jobs in construction (*New Mexico: Energy and Employment 2020*, 2020). Traditional transmission and distribution contribute over 9,600 jobs with microgrids making up the additional 4,000 TDS employees in the state. According to USEER's Wage Report, traditional TDS workers earn $34.24 per hour which is 68 percent higher than the national average median wage. Jobs in the sector have increased by 10 percent in the past two years. Despite its expected growth of only 3 percent next year, TDS offers opportunities for those living in San Juan and Eddy county who will experience declines in fossil fuel usage.

TDS positions are concentrated similarly to the other sectors in Bernalillo. However, interestingly Bernalillo holds almost one third of all microgrid jobs despite their increased use outside of the region. Other high employment regions are in Lea and San Juan counties where fossil fuel mining and extraction are high. Foster et al 2020 found that location is reported to be one of the reasons why construction contractors and utilities have difficulty in hiring, offering New Mexicans opportunities outside of the state metropolitan areas. Yet, there will still need to be work in expanding training for any individuals living in more remote areas that align with cultural practices (*New Mexico Clean Energy Workforce Development Study*, 2020).

Energy Efficiency

Rapidly growing sector, energy efficiency jobs are estimated at 6,099 workers in New Mexico with a concentration in Bernalillo, Dona Ana and Santa Fe counties (*US Energy and Employment Report: 2017 County Level Data*, 2017). In just the past year, EE employment jumped over 4.8 percent and is expected to increase an additional 3 percent this upcoming year. This is regarded as one of the most important sectors for reducing carbon emissions in the near term and also pays a wage premium up to 25 percent above national wages (*USEER: Wages, Benefits, and Change*, 2021). It also is beneficial for reducing household energy bills and allowing citizens to save valuable dollars.

However, those who are familiar with New Mexico geography should note that Bernalillo, Dona Ana and Santa Fe are urban counties with a smaller native population. This is important to keep in mind as we look for opportunities for New Mexican tribes and pueblos. Several strategic energy plans by tribes like the Acoma Pueblo have noted that there is great potential for energy efficiency opportunities. Many pueblos and tribal members still live in traditional dwellings that are not well designed to save the resident electricity or heat.

Matching efforts to update traditional homes, a focus on training workers to go into energy efficiency can make use of the future workforce demand. Workers in energy efficiency are concentrated in the construction industry, which is facing a large hiring crisis due to lack of experience (*2020 US Energy and Employment Report*, 2020). This offers a reason for tribes to build out their construction workforce as well as revamp housing in their communities. But there are also opportunities in HVAC mechanics, electricians, and plumbers who install and maintain efficient lighting, high efficiency heating and cooling. This is another area that will be demanded with the prospective American Jobs Plan rollout and offer an additional 23 to 28 percent more wage earnings than construction workers.

Hiring Difficulties

As briefly discussed, each sector and industry have varying effects on the labor force and wages for workers. The 2020 US Energy and Employment Report identifies the top three energy jobs that are the hardest for New Mexico energy employers to hire are:

1. Electrician/construction workers — $24.69 median hourly wage
2. Sales, marketing, or customer service — $32.48 median hourly wage
3. Engineers/scientists — $39.49 median hourly wage

This was because employers stated that workers lacked experience, training, or technical skills needed to complete the job. Additionally, potential employees did not have sufficient qualifications or did not fit the company's culture (*New Mexico: Energy and Employment 2020*, 2020).

3.22 New Mexico's Clean Energy Training Systems

New Mexico is known to have a far reaching university and community college system that serve 109,482 students (*Fall 2009 to 2020 Postsecondary Enrollment Headcount*, 2021). Of those, 9,748 students identify American Indian and 79 percent of which attend a community or tribal college (*Enrollment by Ethnicity Fall 2020*, 2021). As for the current clean energy training landscape, a UNM Clean Energy Workforce Development study found that New Mexico had the following training sites available to the public:

- 10 general energy-based training institutions
- 6 institutions that offered solar specific certification
- 2 colleges, Mesalands and Clovis, that offer wind technology training programs
- 1 specialized microgrid and smart grid technology certificate

In addition to these institutions, there are colleges that are already running or looking to develop programs for new technologies and skills. For instance, the Central New Mexico Community College is running an information technology (IT) workforce credit and non-credit program, giving students an opportunity to learn how to code with overarching student support. It is estimated that the program has over 600 graduates, with an 85 percent job securitization rate and a growing number of students going into the energy sector (A. Sisneros Watchman, personal communication, February 3, 2021). And the program's success has been noted – institutions outside the state have sought advice on how to bring similar initiatives to their region. Recently, CNM community college was able to share their success as it granted Dona Ana in Las Cruces

with its first curriculum license and have started training instructors to teach IT bootcamps in southern New Mexico.

And San Juan College, a highly recognized community college for preparing fossil fuel workers is developing hydrogen, lithium ion battery recycling, electric vehicle technician, and water technology curriculum (*New Mexico Clean Energy Workforce Development Study*, 2020). As mentioned previously, this is the same institution who is developing an MOU with the City of Farmington, Farmington Electric Utility System and Enchant Energy to develop a one year certificate and two year associate program (San Juan College, 2020). This agreement will not only extend the life of the plant, will give individuals specialized experience in operating and maintaining a CCUS facility.

Two of New Mexico's specialized training centers in clean energy as noted above are Santa Fe and Mesalands Community College. Santa Fe Community College is known to be one of a handful of microgrid and smart grid training programs in the country. Mesalands is recognized for its wind turbine technician training which offers three plans of study: a one-year occupational certificate, a one-year applied science certificate, and a two-year degree. Tuition ranges between $2,400 to 4,270 per semester depending on whether a student qualifies for in state or out-of-state tuition and is expected to earn a salary post-graduation of $40,000 up to six figures ("Wind Turbine Technician Training | Wind Energy Technology," n.d.). Students not only gain foundations in wind turbine mechanics but learn how to maintain and operate the wind turbine onsite. Yet, despite the numerous opportunities available and the ability to train more students, Andy Swapp, the wind technician program director, says "one of the hardest jobs is recruiting students". Swapp says this is due to the lack of student knowledge about clean energy jobs as well as the general pressure for students to pursue a four-year degree (A. Swapp, personal communication, January 26, 2021). These recruitment issues are important to keep in mind as we look at the indigenous workforce and potential challenges to strengthening a native energy workforce.

One potential threat is the lack of maintained worker training and worker rights in tribal energy projects. I hope the following case study about the Picuris Pueblo in New Mexico demonstrates the need for federal and state policymakers to provide support services for tribes like monitoring contract fulfillment made with tribes as well as mandate that any energy projects on tribal land train and utilize indigenous workers.

Case Study: Picuris Pueblo

For background, the Picuris Pueblo is one of the smallest and poorest of the 19 pueblos. With only 306 recognized members and 86 current residents, the two solar arrays installed were designed to give homes and tribal buildings power (*Northern Pueblos Housing Authority – 2016 Project*, n.d.). As part of the DOE Tribal Energy Program, the National Renewable Energy Laboratory and other researchers helped the pueblo develop a strategic energy plan with the overall goal of implementing 100 percent renewable energy.

In the past few years, there have been two solar arrays implemented in the region. Both projects were designed to deliver the community with 1 MW of power each. The first solar array was installed in 2016, on a 10-acre plot of tribal trust land (*Final Report Pueblo of Picuris: Phase I Community Solar Project*, 2020). It was estimated that the array would produce 2.6 million kWh annual to offset the cost of energy for the entire pueblo. The project was completed and still running today. However, in the process there were several challenges that the project faced. These problems included inadequate request timeline for

RFPs, geotechnical analysis completed during the project and not before the RFP call, and design build agreement did not adequately set terms for deployment.

*Figure 20: Operational solar array in the Pueblo of Picuris (*Final Report Pueblo of Picuris: Phase I Community Solar Project, *2020)*

Due to the limited number of project proposals the tribe received, there were few options and prices that Picuris had available. Additionally, the geotechnical analysis, an evaluation of the land and soil properties typically required for solar projects, was conducted during the RFP process. Therefore, project developers were unaware of the type of soil and other costs that might impact panel installation, leading to unforeseen costs and delays. Finally, the design build agreement was not initially followed. Within the design build agreement, the selected developer planned to hire and train local tribal members. However, after the project was finished, the pueblo reported that the developer in fact hired only a few workers and gave them the most basic training. This training primarily consisted of knowledge needed to complete manual labor and the developer paid workers less than prevailing wages.

Thankfully, the 2016 project raised issues that were avoided when implementing the 2018 project. The second 1 MW array was designed to provide the tribe revenue under a PPA with Kit Carson Electric Cooperative and lower utility costs. According to 2018 solar data, Picuris estimated a total of $134,846 in generated revenue, assuming a rate of $0.09 per kWh and an annual generation of 2,226,197 (Northern Pueblos Housing Authority, 2018). In the final DOE tribal energy report, Picuris noted improvements to the second project and recommended the following for any future tribal energy projects (*Final Report Pueblo of Picuris: Phase I Community Solar Project*, 2020):

- Begin any project communication as soon as possible with all partners
- Commit and collect all funding before hand
- Conduct geotechnical analysis, project plans, and environmental reports early
- Monitor project developers progress and actions as outlined in the design build agreement

3.23 New Mexico Tribe and Pueblo Workforce

So far, I have given an overview of what the energy workforce and training infrastructure looks like in New Mexico. But it is important to look at where the native workforce is at now by investigating tribal industry and educational attainment. Since each pueblo and tribe are different, I have included all 23 federally

recognized tribes in New Mexico. It is important to note that some of the figures below exclude the Navajo Nation, as it is significantly larger than the rest of the tribes. This is partly because the American Community Survey includes Navajo Nation land across state lines in Arizona, New Mexico, Utah, and Colorado (US Census Bureau, n.d.). And the fact that the Navajo Nation is the largest federally recognized tribe in the United States.

So, what does the industry composition of New Mexico tribes and pueblos look like? Figure 21 gives some insight into where workers are located.

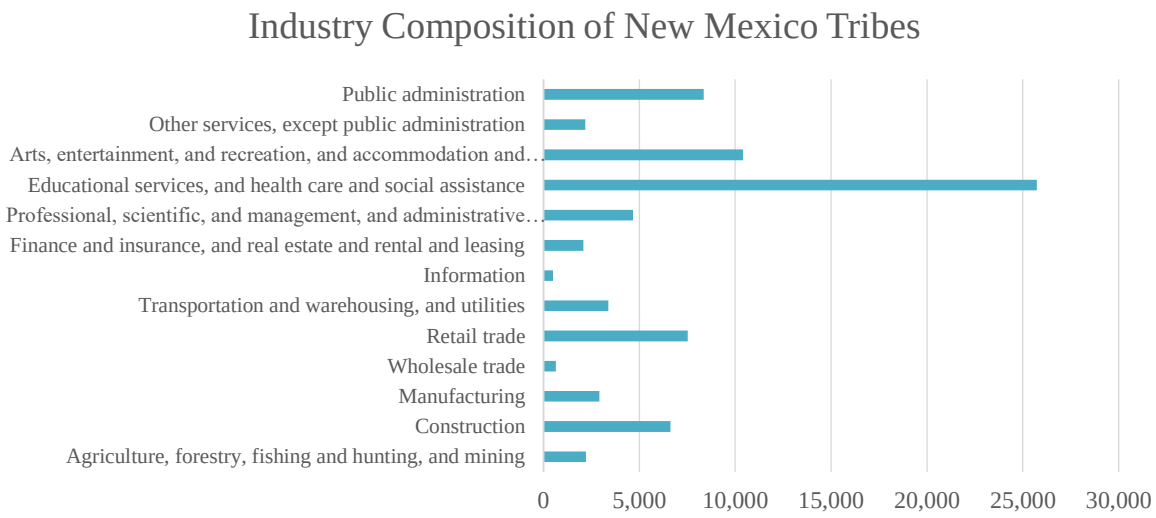

Figure 21: Industry Composition of all New Mexico indigenous workers (American Community Survey, 2015-2019)

By far, educational services and health care and social assistance employ 25,736 workers, the most tribal and pueblo members of any other industry (American Community Survey, 2015). This is followed by arts, entertainment, and recreation with 10,414 workers. As for the industries that are relevant in an energy transition, construction employs 6,619 workers, manufacturing employs 2,915 workers, and transportation and utilities employ 3,389 workers. Surprisingly, professional, scientific, and management native employment exceeds that of tribal members working in manufacturing and transportation and utilities, with a reported 4,668 workers across all tribes and pueblos. Although, this view looks at the entire tribes and pueblo workforce in New Mexico. So, how does the industry composition look like by pueblo?

In Figure 22, it is clear that some pueblos and tribes have more workers in a particular industry than others. For instance, manufacturing has large distinctions between pueblos. Zuni, Zia, and Santo Domingo pueblos have a high percentage of their workforce in this area whereas Santa Ana and Santa Clara do not. Additionally, Nambe, Isleta, Ohkay Owingeh, and Picuris have a higher percentage of their pueblos employed in professional and scientific services. Construction makes up a larger portion of the Jicarilla Apache, Sandia Pueblo, Taos Pueblo and the Navajo Nation. And finally, public administration plays a large role for the Jicarilla Apache and Ute Mountain.

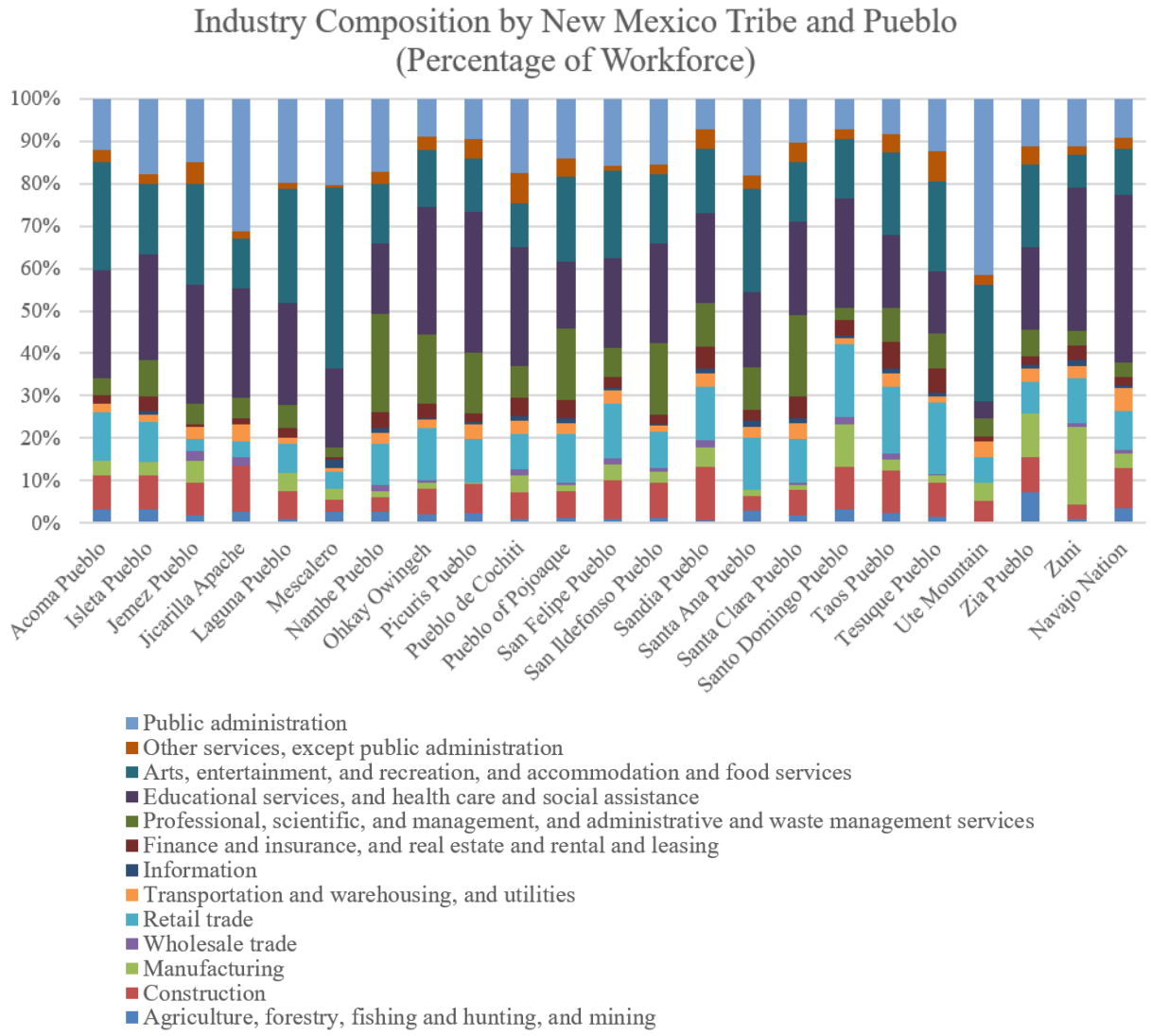

Figure 22: Industry composition by tribe and pueblo (American Community Survey, 2015-2019)

However, other industries have slightly smaller variation like transportation. Meanwhile, the information industry does not play a role in any of the tribes and pueblos in the state. This is an area that tribal members should invest resources for training if tribal members are interested.

Now that we have looked at the industry breakdown of pueblos, it is important to consider where tribal members are starting from. Some industries like professional, scientific and technical services will require workers with higher levels education which pueblos like Santa Clara, Taos, and Pojoaque can supply. But, pueblos like Zuni, Sandia, Ohkay Owingeh, and Laguna Pueblo might need to focus efforts on strengthening their workforce pipeline in the building trades through apprenticeship programs. This is not to say that all tribes and pueblos should not push students to pursue four year degrees. Instead, tribes with lower high school graduation and more students who have some college education, should put their resources towards the earlier end of the workforce pipeline.

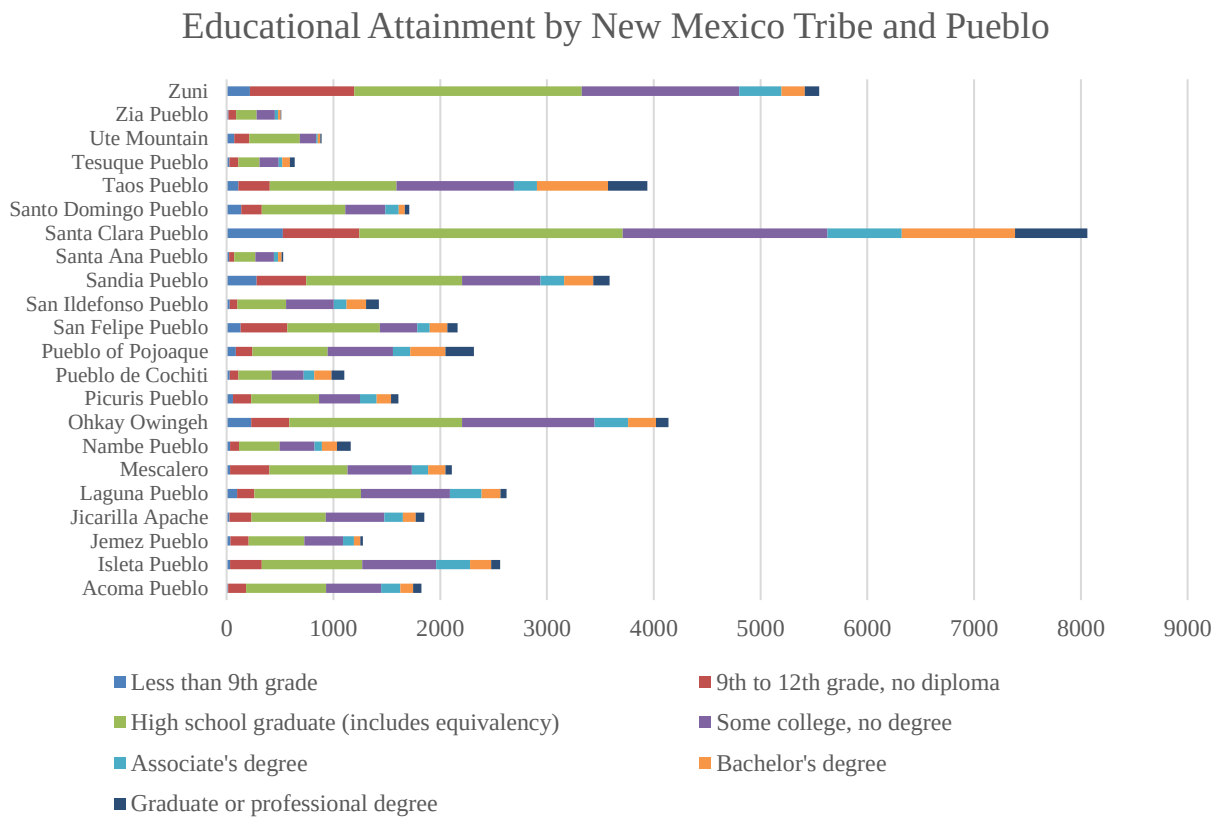

Figure 23: Educational attainment by tribe and pueblo (American Community Survey, 2015-2019)

Yet, it should be noted that there is still much work in strengthening worker pipelines associated with the building trades. Common building trade occupations are electricians, plumbers, and construction workers. Training for these positions typically is conducted through unions and apprenticeship programs. In 2020, there were 2,364 active apprentices in New Mexico in 60 recognized apprenticeship programs (*Data and Statistics | U.S. Department of Labor*, n.d.).

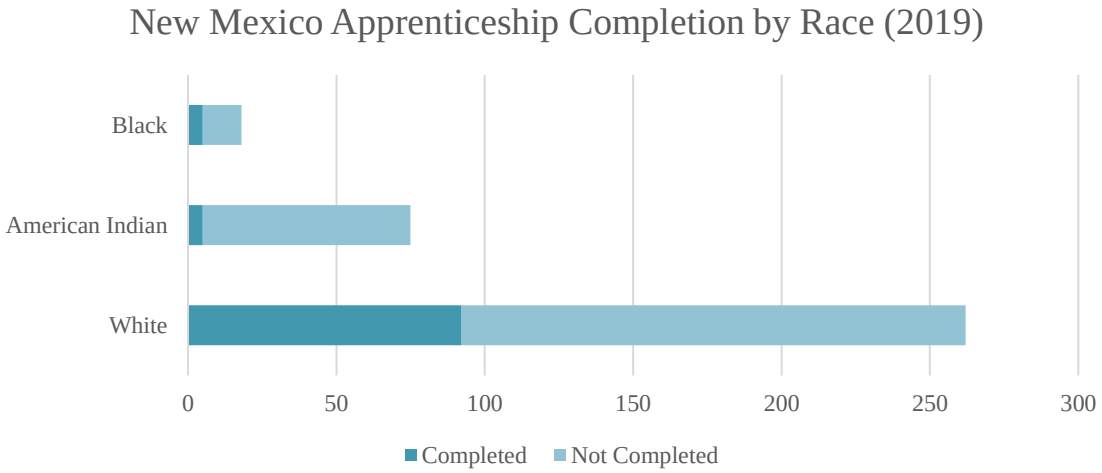

Figure 24: New Mexico Apprenticeship Completion showing 2019 expected and actual completers by selected race (Data and Statistics | U.S. Department of Labor, n.d.)

But completion rates for apprenticeship programs in New Mexico is low. As of 2019, there were an estimated 15,656 individuals who ever entered an apprenticeship in New Mexico (*FY 2019 Data and Statistics | U.S. Department of Labor*, 2019). Of those, only 4,941 ever completed an apprenticeship program as recorded, equating to a 31.5 percent completion rate. But, as shown in Figure 24, the completion story varies by who the individual is. For instance, looking at the expected and actual apprenticeship graduates in 2019, individuals identifying as white had a 35 percent graduation rate compared to American Indians of 6.6 percent.

As discussed in Chapter 1, there are many ways to address workers falling through the pipeline. In New Mexico, tribes and pueblos have access to a number of rich clean energy training facilities. While they are quite sparse throughout the state, tribes can look at opportunities to partner and license curriculum for tribal members. Additionally, tribes should investigate the best methods of how to support their tribal members and students to succeed through this program. While much of this support is dependent on access to funds, tribes should look at what are specific areas that will set up tribal members for success. This way tribes will have an answer or mission to accomplish when new funding is given to them from state and federal resources. To support these initiatives, I recommend state policymakers dedicate at least $1 million to workforce development training programs. Funds could go towards increasing access to promising programs like the CNM IT training program through licensing or apprenticeship support.

3.3 An Indigenous-Designed Energy Future

Supplementing the federal view of native consultation practices and representation, I offer an example of what an indigenous-designed energy plan looks like with the goal of providing insight into how one tribe developed a strategic energy plan with the input of their tribal members.

Case Study: Acoma Pueblo

The Acoma Pueblo is said to be “one of the oldest continuously inhabited villages in North America” (Concho, Raymond; Patel, Arvind, 2018). It is home to 5,196 enrolled tribal members, 2,906 of which still live on Acoma tribal land. Acoma is made up of 800,000 acres of trust and fee land. According to the pueblos history, the Acoma people were tied to nature in the form of farming, pottery, and herd trading before 1930 (Indigenous Collaboration, 2018). Between 1930-1970, more infrastructure was constructed, like water lines, highways, and electricity. This period also marked the introduction of uranium mining, where four companies built 10 mines and mills. Housing and economic development efforts continued through the 1970-1990s including the building of a tribal office, a gas station, a casino, and a truck stop. In 2000, more issues arose as the Great Recession forced workforce layoffs. At the same time, the New Mexico government started looking into getting shares of casino profits, one of the economic foundations that the tribe had.

A 2018 Pueblo of Acoma Strategic Energy Plan states that there is $32 million need for water, wastewater, solid waste, natural gas and electricity. The Pueblo of Acoma also raised the desire to create an electric utility in order to increase tribal sovereignty, support economic development, protect natural resources, and

drive renewable energy development – this eventually did occur. The report lays out cost estimates for future projects like a 1 MW solar farm, conversion of windmills to solar pumps, a bridge, and water and electric line construction (Indigenous Collaboration, 2018).

One of the most interesting aspects of the strategic energy plan was the community vision section (shown in Figure 25) where community members were encouraged to picture what Acoma's energy future would look like. This was organized through a community workshop to answer the question: *"What is in place in Acoma in 2028 that tells us we are serving the energy, development and community needs well and appropriately?"* (Indigenous Collaboration, 2018). For diverse learning and training opportunities, community members envisioned job training for future energy projects, year-round school and youth employment, Acoma's own higher educational institution or technical school and enhanced employment in plumbing, electricians, wastewater operators, and environmentalists. In terms of a sustainable and diverse energy portfolio, individuals asked for 100 percent of their energy needs to be met through either conventional and renewable energy and improved infrastructure, particularly buildings, roads, broadband, and electricity. To attain continual revenue generation, participants proposed an agricultural plant, local grocery store, energy expansion, and regional distribution center for goods. Other recommendations included LED lighting in 100 percent of homes, community living center, improved hospital building, and grey water recycling.

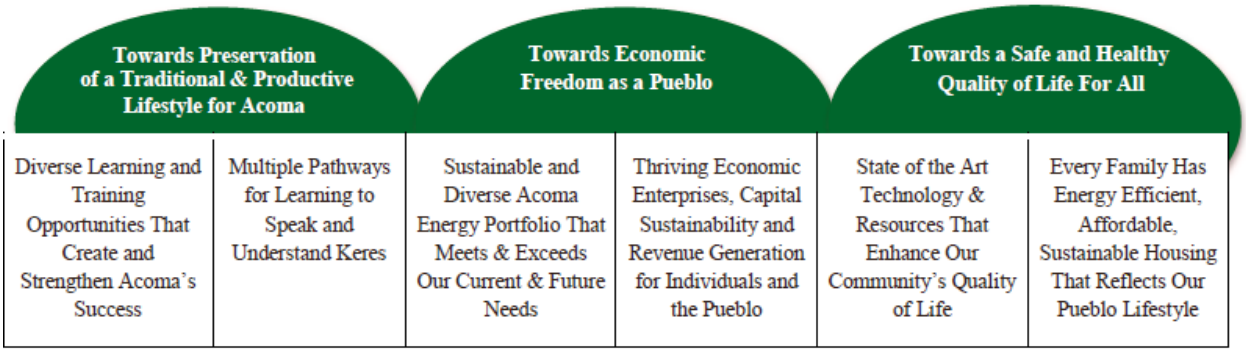

Figure 25: Acoma Pueblo Strategic Energy Plan: Community Vision. Image from: (Indigenous Collaboration, 2018)

The workshop also asked participants: "What are the issues blocking Acoma's energy vision?" and tribal members responded with the following feedback (Indigenous Collaboration, 2018):

"What are the issues blocking Acoma's energy vision?"

- Lack of honest, constant dialogue
- Low community engagement and inclusion in decision making process at the local and statewide level
- Limited housing
- Difficulty leveraging existing assets through usual financial mechanisms and challenge obtaining funds to match federal projects
- "unfocused support" of practical education and workforce training

(Indigenous Collaboration, 2018)

The strategic plan also identified positive and negative trends within the Pueblo that will affect energy development (Indigenous Collaboration, 2018). Positive trends recognized were bringing outside knowledge in, growing acceptance of a green movement, improved broadband development, sand and gravel development, updated tax and tribal codes, and forming the Acoma Electricity Utility Authority. Negative trends within the pueblo included decreasing participation and community interaction on issues, dropping revenue for tribes, no newspaper or web page, no land use plans, limited capital, decreasing state funding and not great job opportunities for members. As for advantages to building out energy projects, Acoma raises its management capacity, access to infrastructure through a natural gas line, and partnerships with important stakeholders like NM Gas Company, DOE, Sandia National Laboratory, and Avant Energy.

Chapter 4: Policy Recommendations

To plan an inclusive and equitable indigenous energy transition, policymakers need to develop policies that promote tribal energy sovereignty. "Three decades of research by NCAI and others confirm that tribal self-determination/self-governance is the only policy that has ever worked in improving Native people's lives and quality of life in tribal communities" (*Empowering Tribal Workforce Development: Indian Country's Policy Recommendations for the Federal Government*, 2020). This means that policymakers need to address the inequities I raised as it relates to energy development, workforce development, and tribal consultation and representation. Based on my findings and incorporating elements of distributional, recognitional, procedural, and restorative justice throughout, I recommend the following actions for federal and state level decision makers.

4.1 Federal Policy Recommendations

Energy Sovereignty Recommendations

As discussed, tribal nations have a long history and financial tie with the fossil fuel industry. In addition to the natural boom and bust nature of oil and gas that tribes have endured, tribes face an energy system designed against them. The long history of the reservation system and restrictions on how tribes use land, prevent them from making full use of their land. Likewise, federal funds for tribal energy projects are miniscule and do not give tribes the support they need to meet the high initial costs of clean energy deployment.

To address some of these restrictions, tribes can create tribal utility authorities "for self-determination and economic growth" (*Tribal Authority Process Case Studies: The Conversion of On-Reservation Electric Utilities to Tribal Ownership and Operation*, 2010). These challenges are quite solvable with the right support from federal and state governments. Therefore, I advocate for governments to encourage and support tribes from creating their own utility authorities.

In planning an inclusive, equitable indigenous energy transition, I also recommend the following actions:

1. **Set aside EDA funds to support fossil fuel reliant tribes**
   I recommend that a federal program provides transitional funding to tribes that are particularly reliant on fossil fuel royalties through the EAA grant program. EAA should appropriate $570 million per year (equivalent to 50 percent of tribal fossil fuel royalties in 2019) for five years and then decrease by 10 percent each year for the following five years. These funds should be separate from the rest of EAA grants, so that tribes do not have to compete with other communities.

2. **Dramatically increase DOE TEP funding to promote energy project development**
   I recommend that DOE create a dedicated fund within TEP and eliminates the competitive grant program. High initial costs prevent tribes from building out clean energy projects. For tribes that have not participated in the TEP previously, at least $300,000 should be guaranteed to any tribe in

order to evaluate their renewable resources through a feasibility study. For tribes that have not participated in TEP and are not reliant on fossil fuel royalties, I recommend that TEP dedicates at least $1.2 million per tribe to guarantee funding for first stage planning grants and a small deployment project. And finally, I recommend that TEP increase annual grant funding to $570 million per year (equivalent to 50 percent of tribal fossil fuels in 2019) for five years and then decrease by 10 percent each year for the following five years. The $570 million would be available to all tribes, distributed by set of criteria that takes into account: unemployment rates, population, industry composition, and other demographic information.

3. **Increase funding to IEED's TEDC grant program to promote tribal energy sovereignty**
   There are several steps that tribes need to take to consider and form a tribal utility authority (TUA). The first step requires a feasibility study to see if a TUA is even cost effective. To do this, tribes will need to conduct a valuation of electric facilities, complete a field inventory, evaluate current system condition and customer load and much more. However, this cost effectiveness study will require financial resources to complete, whether that is to pay for a consultant to conduct the study themselves or for the tribe to pay for training for a tribal member to gain such knowledge. Therefore, I recommend that Congress appropriates at least $5 million per year for five years that IEED can use for TEDC grants. Increased funds will allow IEED to give grants to TEDCs not funded previously as well as jump start TUA formation. Later on in the process, financial support will also help support the salary of a utility expert if needed for the first few years of the utility's formation. This will not only relieve some of the financial burden that tribes might face in matching any federal funds, but also promote capacity building within the TUA's leadership team.

4. **Place all tribes under the BIA owned utility on the path to tribal utility creation**
   As noted in the BIA TUA Formation Handbook, some tribes' electricity is managed by a BIA owned utility. While this might relieve the tribe of some financial burdens, it does not allow the tribe to have as much control over energy and growth planning. Additionally, the incredibly short planning horizons of BIA owned utilities does not give enough time for dedicated renewable project development and does not necessarily guarantee employee hiring preferences as well as buying preferences. For these reasons, to increase energy independence and tribal sovereignty, tribes under a BIA utility should be given the resources and opportunity to make a decision on whether they stay with their current utility or create their own.

5. **Allow tribes to use federal renewable tax credits**
   "Tribal governments are considered sovereign, non-taxable entities and cannot use [renewable energy] financial incentives" (Jones & Necefer, 2016). Therefore, following NCAI's recommendation, Congress should extend federal tax credits for tribes to further drive clean energy development on tribal land (*Climate Report | Senate Democratic Leadership*, n.d.).

Workforce Policy Recommendations

According to NCAI and its partnered tribes, the role of the federal government should be "to foster a positive environment for tribal workforce development by removing the obstacles that obstruct tribal innovation" (*Empowering Tribal Workforce Development: Indian Country's Policy Recommendations for*

the Federal Government, 2020). Based on these identified challenges, I propose the following recommendations, that draw from the National Congress of American Indian's case studies and policy recommendations:

1. **Increase financial resources for tribal workforce training programs and reduce funding use restrictions**
   According to the NCAI workforce development report, the tribal workforce development programs under the Comprehensive Services Program (CSP) and the Supplemental Youth Services Program have stagnated around $68 million per year. To further support tribes in forming a workforce development plan and carefully designed career pathways, it is crucial that there are increased funds to the Department of Labor's CSP and Youth Services program. Additional funds should go towards creating a few positions that can coordinate with the Department of Energy's Indian Energy Program and other agencies to align workforce development plans with strategic energy plans. And finally, it is important to loosen funding use restrictions like the Career Pathways grant. As illustrated by Gila River, decreasing fund use restrictions allowed the tribe to fill in the gaps that their tribal members faced. Considering that tribal nations are not a monolith and have their own economic and energy story, it is important to grant indigenous people the ability to design a program based on their tribal needs.

2. **Provide technical assistance on workforce development issues**
   To build out a workforce pipeline that meets the needs of tribes, it is important to re-establish a technical assistance program under WIOA (*Empowering Tribal Workforce Development: Indian Country's Policy Recommendations for the Federal Government*, 2020). The program previously funded tribal leaders to travel to Washington DC in order to learn from workforce development experts through a workshop and work with tribal leaders to improve their programs. However, the Employment and Training Agency ended this program and therefore, tribes have little feedback on how to make improvements. And as part of re-establishing the program it is critical for any technical experts working on native workforce issues, to complete a cultural competency training to ensure that professionals abide by cultural customs.

3. **Expand career and technical education program opportunities for green jobs as well as re-entry programs**
   With increased funds, the CSP and Youth Services program and Career Pathways program should also look at opportunities as it relates to developing a workforce pipeline that can meet their tribes renewable energy goals. Ideally, the strategic workforce plan would be done at the same time or in alignment with tribal strategic energy plans as well as educational and workforce training institutions. This will ensure that tribe specific career pathways are created with the renewable goals in mind and begin to train the next generation of indigenous energy workers.

4. **Require native representation on state workforce development boards and federal labor initiatives**
   To guarantee an inclusive indigenous energy transition, it is important that native interests, especially as they relate to the native workforce, are represented where it matters. Therefore, I endorse NCAI's recommendation to change WIOA to require at least one seat within state

workforce development boards to be dedicated to native workforce issues. Additionally, there should be increased native representation within groups like the new Office of Energy Jobs and the Native American Employment and Training Council. And while not included within the federal policy jurisdiction, there should be increased native leadership within unions and workforce development consortium like the Center for Energy Workforce Development.

5. **Support and finance data collection for tribal workforce development**
   While there were initial efforts to fund an American Indian Population and Labor Force Report, NCAI found there has been little progress. And any discussion on how to carry this effort out did not include tribal leaders. Therefore, I endorse NCAI's recommendation to increase indigenous workforce data collection and to include tribal leaders. This includes mandating state workforce reports carve out a section on native workforce numbers as well as the creation of a supplemental report modeled after the US Energy and Employment report. Such efforts will finally count indigenous workers but also track how federally recognized tribes are impacted by the future implementation of President Biden's American Jobs Plan, by supporting a supplemental indigenous workforce report modeled after the US Energy and Employment Report.

Consultation and Representation Recommendations

Based on federal agency current consultation practices and efforts, I draw on recommendations that NCAI and the Congress climate reports to urge federal action in the following areas:

1. **Improve information infrastructure like broadband access to native communities**
   Tribal engagement and consultation rely on community discussion forums and feedback seminars that rely on the internet. Without affordable and reliable internet access, tribal nations are unable to participate on issues that impact their communities. Therefore, I endorse Resources for the Future's recommendation to appropriate $35 billion over 10 years with the goal of expanding rural broadband across the country for tribal and rural communities (*Policy Options to Enable an Equitable Energy Transition,* 2021).This will also ensure that tribal leaders and members are able to access up to date information on project developments and other activities that might affect them.

2. **Allocate $1 million to the Department of Interior to hire full time staff for Energy Subgroup activities**
   Created in 2013, the Interagency White House Council on Native American Affairs' Energy Subgroup aimed to "improve coordination of Federal programs and the use of resources available to tribal communities" to promote sustainable economic development in energy, transportation, housing, workforce development, and other infrastructure (The White House Office of the Press Secretary, 2013). The original staffing model made it hard to maintain continued participation and engagement because staff and dedicated funding were limited. This prevented the Energy Subgroup from making its five-year strategic plan as outlined. Therefore, $1 million should be allocated to the Department of Interior to hire full time staff dedicated to Energy Subgroup activities.

3. **Mandate and monitor meaningful engagement and consultation with tribal leaders** (recommendation sourced from House Climate Report)
   Agencies should reevaluate current consultation proposals and engage with tribes to develop a new and inclusive process. The process should encourage two-way communication as well as mandate updates on how tribal input was implemented. Additionally, funding should be dedicated to supporting a full-time tribal liaison for all agencies with the sole purpose of building a relationship with tribal leaders and members. Tribal consultation should continue to be monitored by the GAO under its already defined used metrics.

4. **Increase native representation in federal agency leadership positions**
   Deb Haaland is the first indigenous person to be a member of the president's cabinet. As Secretary of the Interior, Haaland will be able to address the backward moving policies that dictate how tribal nations can utilize their lands. Native representation in places of decision-making power is critical to ensure a transition that incorporates procedural justice and works on distributional justice issues. These native leaders are also needed to consistently work on raising indigenous practices as a part of recognitional justice and are working towards restoring justice to tribal nations across the country.

4.2 State Level Recommendations

Energy Sovereignty Recommendations

Drawing from past experiences of tribal energy projects in New Mexico and the All Pueblo Council's resolution, state and federal policy actors should take the following actions:

1. **Increase funding to the New Mexico Tribal Infrastructure Project Fund to build transmission lines to serve their communities and fund tribal energy efficiency projects**
   In addition to federal TEP funding, I recommend that New Mexico update its HB0868 bill, to increase funding to the Tribal Infrastructure Act. Previously, the bill called for "five percent of the project fund or five hundred thousand dollars ($500,000) is appropriated from the project fund to the Indian affairs department" (2005 House Bill for HB0868, 2005). However, to increase the number of tribal energy infrastructure projects, I recommend funding is increased to at least $2 million per year for 10 years. This will allow tribes to continue to build transmission lines to serve their communities as well as provide funds for energy efficiency projects. And for states, that do not have a dedicated fund for tribal infrastructure projects, I urge state governments to implement one.

2. **Mandate rural electric coops to allow community solar projects on tribal land** (All Pueblo Council of Governors, 2021)

3. **Dedicate funds to tribes in the event of passed carbon pricing or cap-and-trade**
   New Mexico should consider dedicating a portion of funds to support tribes that experienced financial hardship due to the energy transition if carbon pricing or cap-and-trade policies are

implemented *(International Carbon Action Partnership, 2021) (Senate Climate Report, feedback from tribal leaders).* Since the tribal carve out would be dependent on pricing and other factors, I encourage policymakers to keep this in mind for the future.

State Workforce Policy Recommendations

Tribes and pueblos within the state have and are in the process of drawing up strategic energy plans. To support such efforts, I recommend New Mexico and other state government to do the following:

1. **Provide funding to tribes and governments to license and/or access training resources**
   To supplement federal funds, states should dedicate at least $1 million to workforce development training programs. Funds could go towards increasing access to promising programs like the CNM IT training program through licensing or apprenticeship support.

2. **Provide funding to tribal energy efficiency workforce programs**
   Allocate at least $1 million per year for 10 years in to create or support tribal energy efficiency workforce programs. It is important that state decision makers invest education on tribal lands. Financial support can be increased scholarship offerings for native students, funds to bring in energy efficiency instructors to tribal colleges, and funds to license successful curriculum from other colleges.

3. **Require at least one native representative from each of New Mexico's pueblos in decarbonization planning**
   In New Mexico, each pueblo has a very different history and energy development story. This means that an energy transition will need to address problems that are specific to a pueblo. To prevent perpetuated inequities through decarbonization policy, I recommend a tribal leader from each pueblo should be represented when making legislation in New Mexico and other states.

4. **Require all energy projects occurring on native lands to train and utilize native workers**
   To prevent shutting out tribal workers, states should require that all energy projects occurring on tribal lands must train and contract indigenous workers.

Chapter 5: Conclusion and Future Work

The purpose of this paper is to highlight some of the inequities that indigenous people have faced in energy development. I argue that these inequities are perpetuated by federal policy that restricts indigenous peoples' economic opportunities and forces them to rely on fossil fuels. These challenges now make it incredibly more difficult for indigenous people to fully participate in an energy transition and embrace large renewable resources. To create an inclusive and equitable energy transition that adequately serves indigenous people, I indicate that policymakers need to develop legislation in partnership with indigenous communities. Future legislation should consider past tribal energy development experiences and be designed with the four pillars of energy justice in mind: distributional, recognitional, procedural, and restorative.

In describing the current energy system and failures that tribes live with, I offer several recommendations. Overall, I recommend that policymakers construct policies that promote tribal energy sovereignty. To do this, policymakers will create more flexible land management processes and eliminate practices that require tribes to jump through more bureaucratic hoops than the rest of the American population. Additionally, policymakers will need to create policies that address workforce challenges by funding tribal energy workforce programs, increasing native representation on workforce development boards, and increasing indigenous workforce data collection. And finally, policymakers at all levels need to improve tribal consultation practices as well as increase native representation throughout all levels of government.

There is clearly a lot of work that needs to be done for an inclusive and equitable energy transition to occur for indigenous people. For researchers, community leaders, and policymakers interested in working on the issues I presented, I recommend conducting an in-depth analysis on the exact federal funding tribes will need and for what period federal funding should be distributed. Also, I encourage more research into identifying what tribes across the country have <u>not</u> participated in the DOE Tribal Energy Program as I recommend that TEP should dedicate a portion of funding for those tribes to conduct energy feasibility studies. I encourage a state-level analysis similar to the one I did on New Mexico to identify how states can better support tribes on issues related to energy development and its workforce. I also recommend that researchers identify what areas lack data collection that might be necessary to identify transition issues related to the workforce, energy sector, and economic development. Additionally, I suggest that an updated tribal utility authority handbook be created and include experiences that tribal utilities have faced since 2013, when the last handbook was created. And finally, to determine what levels of native representation are needed in decision making circles, I recommend an investigation into demographic information for leaders in various levels of federal agencies.

Appendix I: Agency Consultation Definitions

Table 8: Selected consultation definitions by agency (Tribal Consultation: Additional Federal Actions Needed for Infrastructure Projects, 2019)

Bureau of Land Management	Consultation is "the conduct of **mutual, open, and *direct two-way communication*** in good faith to secure meaningful and timely participation ***in the decision-making process, as allowed by law***"
Department of Interior	The basis of consultation is rooted in meaningful ***dialogue where the viewpoints of tribes and the Department of the Interior, including its bureaus and offices***, are shared, discussed, and analyzed***. A consultation session is,*** *but is not limited to****, in-person meetings, video-conferences, teleconferences, and correspondence to discuss a specific issue***. In the case of in-person meetings, video-conferences, and teleconferences, the consultation may be expanded upon through subsequent correspondence after consultation is initiated. On a case-by-case basis, consultation may be held through a series of written correspondence with the tribal leadership, but this process of utilizing written correspondence should only be used when other methods of dialogue are not feasible.
Department of Transportation	Consultation "***refers to meaningful and timely discussion in an understandable language with tribal governments*** during the development of regulations, policies, programs, plans, or ***matters that significantly or uniquely affect federally recognized American Indian and Alaska Native tribes and their governments***."
Environmental Protection Agency	Consultation is a process of meaningful communication and coordination between Environmental Protection Agency and tribal officials prior to the Environmental Protection Agency taking actions or implementing decisions that may affect tribes. ***As a process, consultation includes several methods of interaction that may occur at different levels. The appropriate level of interaction is determined by past and current practices, adjustments made through this policy, the continuing dialogue between the Environmental Protection Agency and tribal governments, and program and regional office consultation procedures and plans.*** The consultation process is flexible and tailored to the specific needs of Environmental Protection Agency, tribes, and the issues involved. Some consultations may involve multiple communications between the Environmental Protection Agency and tribes, potentially including workshops, webinars, teleconferences, or face-to-face meetings. Multiple communications may be particularly appropriate for highly technical and complex agency actions. ***The policy recognizes that there is no "one-size-fits-all" approach to consultation.*** Environmental Protection Agency's tribal consultation differs from the public notice and comment period, and conducting public outreach, by the nature and timing of the interaction. Tribal consultation is between the Environmental Protection Agency and tribal governments. Tribes can, and do, participate in public comment processes, which are distinct from consultation under the policy.
Department of Agriculture	Tribal consultation is the ***timely, meaningful, and substantive dialogue*** between Department of Agriculture officials who have delegated authority to consult, ***and the official leadership of federally recognized Indian tribes, or their designated representative(s),*** pertaining to agency policies that may have tribal implications. It

	is also important to distinguish between consultation and other actions. ***Notification – the distribution of information from a Department of Agriculture office or agency to one or more tribes - is not consultation.*** Neither are technical communications or outreach activities, however important or influential, between staffs without leadership involvement. While notification, technical communications and outreach are all essential, and are often used as part of consultation, they alone do not constitute government-to-government consultation.
Department of Energy	Consultation is "***prior to taking any action with potential impact upon American Indian and Alaska Native nations***, providing for mutually agreed protocols for timely communication, coordination, cooperation, and collaboration to determine the impact on traditional and cultural ways of life, natural resources, treaty and other federally reserved rights ***involving appropriate tribal officials and representatives throughout the decision-making process, including final decision-making and action implementation*** as allowed by law, consistent with a government to government relationship."

Appendix II: DOE Tribal Energy Project Funding in New Mexico

List of all DOE TEP projects funded in New Mexico since 1994

Tribe	Technology	Year	Assistance	DOE Funding	Awardee Funding	Total Funding
Pueblo of Zuni	Solar	1994	Feasibility	$91,781	$23,003	**$114,784**
Pueblo of Laguna	Solar	1994	Feasibility	$248,665	$0	**$248,665**
Pueblo of Picuris	Energy Efficiency	1995	Feasibility	$129,197	$27,299	**$156,496**
Pueblo of Nambe	Solar	1995	Feasibility	$152,294	$0	**$152,294**
Pueblo of Jemez	Wind	1995	Feasibility	$91,608	$23,000	**$114,608**
Jicarilla Apache Nation	Hydropower	1995	Feasibility	$562,136	$180,115	**$742,251**
Pueblo of Laguna	Renewable Energy (Multiple Technologies)	1999	Deployment	$220,820	$55,205	**$276,025**
Jicarilla Apache Nation: Jicarilla Apache Utility Authority	Solar	1995	Deployment	$109,794	$30,194	**$139,988**
Several Tribes Southwestern Indian Polytechnic Institute	Renewable Energy (Multiple Technologies)	2000	Deployment	$523,938	$141,686	**$665,624**
Pueblo of Jemez	Geothermal	2002	Feasibility	$179,056	$0	**$179,056**
Pueblo of Taos	Renewable Energy (Multiple Technologies)	2003	Feasibility	$195,768	$0	**$195,768**
Jicarilla Apache Nation: Jicarilla Apache Utility Authority	Renewable Energy (Multiple Technologies)	2005	First Steps (Planning)	$100,000	$98,790	**$198,790**
Pueblo of Laguna	Renewable Energy (Multiple Technologies)	2005	Feasibility	$199,601	$179,219	**$378,820**
To'Hajiilee Economic Development, Inc.	Solar	2010	Feasibility	$250,000	$0	**$250,000**
To'Hajiilee Economic Development, Inc.	Solar	2012	Feasibility	$301,778	$363,780	**$665,558**
Santo Domingo Tribe	Solar	2015	Deployment	$245,382	$245,383	**$490,765**
Pueblo of Zia	Renewable Energy (Multiple Technologies)	2012	Feasibility	$179,147	$35,000	**$214,147**
Pueblo of Acoma	Energy Efficiency	2017	First Steps (Planning)	$163,363	$23,365	**$186,728**
Northern Pueblos Housing Authority	Solar	2018	Deployment	$1,000,000	$1,313,781	**$2,313,781**
Northern Pueblos Housing Authority	Solar	2016	Deployment	$1,000,000	$1,221,000	**$2,221,000**

Data comes from: (*Tribal Energy Projects Database*, n.d.) (*Archived Tribal Energy Projects Database*, n.d.)

Bibliography

2005 House Bill for HB0868, no. HB0868 (2005). https://www.nmlegis.gov/Sessions/05%20Regular/final/HB0868.pdf

2020 US Energy and Employment Report. (2020). Energy Futures Initiative, BW Research Partnership, NASEO. https://static1.squarespace.com/static/5a98cf80ec4eb7c5cd928c61/t/5ee78423c6fcc20e01b83896/1592230956175/USEER+2020+0615.pdf

All Pueblo Council of Governors. (2021, January 14). *All Pueblo Council of Governors passes resolution supporting community solar*. Indian Country Today. https://indiancountrytoday.com/the-press-pool/all-pueblo-council-of-governors-passes-resolution-supporting-community-solar

American Community Survey. (2015, 2019). *Census Tribal Area Data*. https://www.census.gov/tribal/?st=35&aianihh=0010

An Issue of Sovereignty. (n.d.). Retrieved May 3, 2021, from https://www.ncsl.org/research/state-tribal-institute/an-issue-of-sovereignty.aspx

Archived Tribal Energy Projects Database. (n.d.). Energy.Gov. Retrieved April 21, 2021, from https://www.energy.gov/indianenergy/archived-tribal-energy-projects-database

Baker, S. H. (2021). *Revolutionary Power*. Island Press.

Bureau of Indian Affairs (BIA) | Indian Affairs. (n.d.). Retrieved April 23, 2021, from https://www.bia.gov/bia

Clarren, R. (2018, September 5). Idle oil, gas wells threaten Indian tribes while energy companies, regulators do little. *InvestigateWest*. https://www.invw.org/2018/09/05/idle-oil-gas-wells-threaten-indian-tribes-while-energy-companies-and-regulators-do-little/

Climate Report | Senate Democratic Leadership. (n.d.). Retrieved May 12, 2021, from https://www.democrats.senate.gov/climate-report

Coal and Native American tribal lands. (2021, April 29). Global Energy Monitor. https://www.gem.wiki/Coal_and_Native_American_tribal_lands

Concho, Raymond; Patel, Arvind. (2018). *Enhancement of Pueblo of Acoma Utility Authority*. https://www.energy.gov/sites/default/files/2018/12/f58/32-Pueblo-Acomo.pdf

Cozzens, S. (2007). Distributive justice in science and technology policy. *Science and Public Policy*, 85–94. https://doi.org/10.3152/030234207X193619

Data and Statistics | U.S. Department of Labor. (n.d.). Retrieved April 22, 2021, from https://www.dol.gov/agencies/eta/apprenticeship/about/statistics/2020

Department of the Interior. (n.d.). *Natural Resource Revenue Data*. Retrieved April 24, 2021, from https://revenuedata.doi.gov/query-data/?dataType=Production&landType=Native%20American#

Dulce, NM | Data USA. (n.d.). Retrieved April 18, 2021, from https://datausa.io/profile/geo/dulce-nm

Editors, H. com. (n.d.). *Indian Reservations*. HISTORY. Retrieved April 18, 2021, from https://www.history.com/topics/native-american-history/indian-reservations

Empowering Tribal Workforce Development: Indian Country's Policy Recommendations for the Federal Government. (2020). National Congress of American Indians. https://www.ncai.org/ptg/NCAI_WORKFORCE_DEVELOPMENT_BRIEF_v2.0_2020.pdf

Enrollment by Ethnicity Fall 2020. (2021). State of New Mexico Higher Education Department. https://hed.state.nm.us/uploads/documents/Enrollment_by_Ethnicity_Fall_2020.pdf

Environmental Justice Leadership is Non-Negotiable—Tishman Environment and Design Center. (n.d.). Retrieved April 18, 2021, from https://www.tishmancenter.org/blog/ej-is-non-negotiable

ESDWAGOV - San Juan County profile. (n.d.). Retrieved April 29, 2021, from https://esd.wa.gov/labormarketinfo/county-profiles/san-juan

Estus, J. (2020, April 22). *Tribes' billion dollar oil industry ... And now?* Indian Country Today. https://indiancountrytoday.com/news/tribes-billion-dollar-oil-industry-and-now

Fall 2009 to 2020 Postsecondary Enrollment Headcount. (2021). State of New Mexico Higher Education Department. https://hed.state.nm.us/uploads/documents/Fall_2009_to_2020_HC.pdf

Feasibility Study for Photovoltaics, Wind, Solar Hot Water for ON/OFF Grid-Connected Power to SIPI Campus. (2007). Southwestern Indian Polytechnic Institute. https://www.energy.gov/sites/default/files/2016/02/f29/sipi00final.pdf

Final Report Pueblo of Picuris: Phase I Community Solar Project. (2020). Northern Pueblos Housing Authority. https://www.energy.gov/sites/default/files/2020/06/f75/northern-pueblos-2016-solar.pdf

Foster, D., Nabahe, S., Siu Hon Ng, B., & Kearney, M. (2020). *Energy Workforce Development in the 21st Century*. Massachusetts Institute of Technology. http://ceepr.mit.edu/files/papers/roosevelt-project/The-Roosevelt-Project-WP-7.pdf

FPIC-UNDRIP. (n.d.). Puebloactionalliance.Org. Retrieved May 3, 2021, from https://www.puebloactionalliance.org/free-prior-informed-consent

FY 2019 Data and Statistics | U.S. Department of Labor. (2019). https://www.dol.gov/agencies/eta/apprenticeship/about/statistics/2019

Gold, L. (2012). *Establishing a Tribal Utility Authority Handbook*. Utility Strategies Consulting Group, LLC. https://www.bia.gov/sites/bia_prod.opengov.ibmcloud.com/files/assets/as-ia/ieed/ieed/pdf/tribalutility_handbook.pdf

Governor Bill Richardson Sets Bold Agenda for Future of New Mexico's Green Economy. (2010). https://www.cdfa.net/cdfa/cdfaweb.nsf/fbaad5956b2928b086256efa005c5f78/223ffb40106e0269862576b200520b9e/$FILE/nm%20order.pdf

Headwaters Economics. (2020). *A Demographic Profile: New Mexico*. Headwaters Economics.

Hecate Energy—News. (2019, June 6). https://www.hecateenergy.com/news/2019/06/albuquerque-to-get-closer-to-100-with-solar-farm-on-apache-land/

HolyWhiteMountain, S. (2018, November 5). *The Blackfeet Brain Drain*. The Atlantic. https://www.theatlantic.com/business/archive/2018/11/blackfeet-brain-drain/568156/

Impacts of Oil and Gas Drilling on Indigenous Communities. (n.d.). ArcGIS StoryMaps. Retrieved April 24, 2021, from https://storymaps.arcgis.com/stories/0f1111676350434fbf0229bad4e15f99

Improving Federal Management of Programs that Serve Tribes and Their Members. (2019). GAO. https://www.gao.gov/highrisk/improving-federal-management-programs-serve-tribes-and-their-members

Indian Energy Development Additional Actions by Federal Agencies Are Needed to Overcome Factors Hindering Development. (2016). United States Government Accountability Office. https://www.gao.gov/assets/gao-17-43.pdf

Indian Energy Service Center | Indian Affairs. (n.d.). Retrieved April 30, 2021, from https://www.bia.gov/bia/ots/indian-energy-service-center

Indigenous Collaboration. (2018). *Pueblo of Acoma Strategic Energy Plan*. Tribal Administration Auditorium. http://www.puebloofacoma.org/uploads/FileLinks/9b97d21fa9f6437bbe1134ff6ee259f1/2018_Pueblo_of_Acoma_Strategic_Energy_Plan.pdf

International Carbon Action Partnership. (2021). *USA - New Mexico*. https://icapcarbonaction.com/en/?option=com_etsmap&task=export&format=pdf&layout=list&systems[]=103

JAECO Oil Processing Program. (n.d.). Netl.Doe.Gov. Retrieved April 18, 2021, from https://netl.doe.gov/node/3192

Jicarilla Apache Nation—1995 Project. (n.d.). Energy.Gov. Retrieved April 17, 2021, from https://www.energy.gov/indianenergy/jicarilla-apache-nation-1995-project

Jicarilla Apache Power Authority. (n.d.). Janpa. Retrieved April 18, 2021, from https://www.jicarillaelectric.com

Jicarilla Apache Reservation Oil and Gas Plays. (n.d.). Buerau of Indian Affairs. https://www.bia.gov/sites/bia.gov/files/assets/as-ia/ieed/ieed/pdf/DEMD_OG_Jicarilla_OilGasPlays_508.pdf

JOAGA Title 18: Oil and Gas. (n.d.). Retrieved April 17, 2021, from http://www.jicarillaoga.com/uploads/1569879589-CURRENT%20Title18%20Updated%209_18_19.pdf

Jones, T. E., & Necefer, L. E. (2016). *Identifying Barriers and Pathways for Success for Renewable Energy Development on American Indian Lands* (pp. 7, 24). Sandia National Laboratories. https://www.energy.gov/sites/default/files/2017/05/f34/Sandia_Report_2016-311J.pdf

Jr.,Vernon, A., Mary Dorinda;Brundage. (n.d.). *American Indians and Alaska Natives in the U.S. labor force: Monthly Labor Review: U.S. Bureau of Labor Statistics*. Retrieved April 29, 2021, from https://www.bls.gov/opub/mlr/2019/article/american-indians-and-alaska-natives-in-the-u-s-labor-force.htm

Kumar, S. (2017, October 21). *EQUALITY, EQUITY AND JUSTICE*. Medium. https://medium.com/@sandeepkumar_52041/equality-equity-and-justice-5f71ebe31245

Lashof, D., & Bird, L. (2019). *INSIDER: 29 States Have Clean Electricity Standards. Are They Good Policy?* https://www.wri.org/insights/insider-29-states-have-clean-electricity-standards-are-they-good-policy

Long tied to fossil fuels, Native American tribes seek renewable future. (n.d.). Retrieved April 17, 2021, from https://www.spglobal.com/marketintelligence/en/news-insights/trending/yt4S_GA0lX5yKYBpL-oxjQ2

Map of Indian Lands in the United States. (n.d.). Bureau of Indian Affairs. https://www.bia.gov/sites/bia.gov/files/assets/public/webteam/pdf/idc1-028635.pdf

McGirt v. Oklahoma, (Supreme Court of the United States July 9, 2020). https://www.supremecourt.gov/opinions/19pdf/18-9526_9okb.pdf

Montoya Bryan, S. (2020, October 15). *New Mexico utility, tribe to break ground on solar farm*. AP NEWS. https://apnews.com/article/new-mexico-albuquerque-57b9a0bb329e3b82585d3aa5c3add5cd

Montoya Bryan, S. (2020, December 21). *Oil and gas deliver revenues to New Mexico despite pandemic*. AP NEWS. https://apnews.com/article/new-mexico-coronavirus-pandemic-state-budgets-871f263dbdee6ddefb5e114a7d184279

Morehouse, C. (2021). *Biden $2 trillion infrastructure proposal includes billions in spending on transmission, clean energy*. Utility Dive. https://www.utilitydive.com/news/biden-2-trillion-infrastructure-proposal-includes-billions-in-spending-on/597696/

New Mexico Clean Energy Workforce Development Study. (2020). University of New Mexico. https://www.dws.state.nm.us/Portals/0/DM/LMI/NM_Clean_Energy_Workforce_Report.pdf

New Mexico: Energy and Employment 2020. (2020). BW Research Partnership. https://static1.squarespace.com/static/5a98cf80ec4eb7c5cd928c61/t/5e781564087a8924739cbfdd/1584928101717/NewMexico-2020.pdf

New Mexico—State Energy Profile Overview—U.S. Energy Information Administration (EIA). (n.d.). Retrieved April 18, 2021, from https://www.eia.gov/state/?sid=NM

NEW SOLAR ENERGY PROJECT SET TO BE BUILT ON JICARILLA APACHE NATION LAND. (n.d.). Construction Reporter. Retrieved April 17, 2021, from http://www.constructionreporter.com/1/post/2020/04/new-solar-energy-project-set-to-be-built-on-jicarilla-apache-nation-land.html

Northern Pueblos Housing Authority. (2018, December). *Picuris Pueblo 1MW Community Scale Solar Array*. https://www.energy.gov/sites/default/files/2019/01/f58/2.1-Picuris.pdf

Northern Pueblos Housing Authority – 2016 Project. (n.d.). Energy.Gov. Retrieved May 14, 2021, from https://www.energy.gov/indianenergy/northern-pueblos-housing-authority-2016-project

O'Donnell, Kelly. (2019). *San Juan Tax Study Report*. O'Donnell Economics and Strategy. https://www.nmvoices.org/wp-content/uploads/2019/01/San-Juan-Tax-Study-report.pdf

Office, U. S. G. A. (n.d.). *Tribal Programs: Resource Constraints and Management Weaknesses Can Limit Federal Program Delivery to Tribes*. Retrieved April 17, 2021, from https://www.gao.gov/products/gao-20-270t

Past Funded TEDC Grant Projects | Indian Affairs. (n.d.). Retrieved May 12, 2021, from https://www.bia.gov/service/grants/tedc/past-funded-tedc-grant-projects

Policy Options to Enable an Equitable Energy Transition. (2021). RFF. https://media.rff.org/documents/RFF_Report_21-09_Policy_Options_to_Enable_an_Equitable_Energy_Transition.pdf

Poulsen, S. by R. W. (n.d.). An Ever-Moving, Unloved Fish Is Stirring Chaos in the North Atlantic. *The Atlantic*. Retrieved April 18, 2021, from https://www.theatlantic.com/science/archive/2021/02/fish-divided-north/618003/?utm_campaign=the-atlantic&utm_content=edit-promo&utm_source=twitter&utm_term=2021-02-14T00%3A10%3A36&utm_medium=social

Powell, Dana. (2018). *Landscapes of Power*. Duke University Press.

Pueblo of Laguna—1999 Project. (n.d.). Energy.Gov. Retrieved April 21, 2021, from https://www.energy.gov/indianenergy/pueblo-laguna-1999-project

PV Solar Power for the Santo Domingo Tribe's Community Water Pump and Treatment Facility. (2019). Santo Domingo Tribe. https://www.energy.gov/sites/default/files/2019/07/f64/santo-domingo-final-report.pdf

Rabago, Karl. (2008). *Strategic Plan for Energy Efficiency and Renewable Energy Development*. Jicarilla Apache Nation Utility Authority. https://digital.library.unt.edu/ark:/67531/metadc893308/m2/1/high_res_d/934753.pdf

Regan, T. L. A. A. S. (2013, October 11). The War on Coal Is Punishing Indian Country. *Wall Street Journal*. https://online.wsj.com/article/SB10001424052702304906704579111030189700024.html

San Juan College. (2020, June 29). *Development of skilled workforce at San Juan Generating Station*. /news-and-events/2020---news/june/development-of-skilled-workforce-at-san-juan-generating-station/

Santo Domingo Tribe – 2015 Project. (n.d.). Energy.Gov. Retrieved April 21, 2021, from https://www.energy.gov/indianenergy/santo-domingo-tribe-2015-project

Select Committee on the the Climate Crisis. (2020). *Solving the Climate Crisis: The Congressional Action Plan for a Clean Energy Economy and a Healthy, Resilient, and Just America*. https://climatecrisis.house.gov/sites/climatecrisis.house.gov/files/Climate%20Crisis%20Action%20Plan.pdf

Solar power in New Mexico. (2021). In *Wikipedia*. https://en.wikipedia.org/w/index.php?title=Solar_power_in_New_Mexico&oldid=1012532916

Southwestern Indian Polytechnic Institute—2000 Project. (n.d.). Energy.Gov. Retrieved April 21, 2021, from https://www.energy.gov/indianenergy/several-tribes-southwestern-indian-polytechnic-institute-2000-project

Tewa Women United. (2019, April 1). *2019 Legislative Wrap Up | Tewa Women United*. https://tewawomenunited.org/2019/04/2019-legislative-wrap-up

The Ruling. (n.d.). *Crooked Media*. Retrieved April 18, 2021, from https://crooked.com/podcast/the-ruling/

The White House Office of the Press Secretary. (2013). *Executive Order: Establishing the White House Council on Native American Affairs*. https://obamawhitehouse.archives.gov/the-press-office/2013/06/26/executive-order-establishing-white-house-council-native-american-affairs

Top 5 biggest solar farms in the US. (2020, December 24). Construction Review Online. https://constructionreviewonline.com/biggest-projects/top-5-biggest-solar-farms-in-the-us/

Tribal Authority Process Case Studies: The Conversion of On-reservation Electric Utilities to Tribal Ownership and Operation. (2010). Western Area Power Administration, Renewable Resources Program.

Tribal Broadband: Status of Deployment and Federal Funding Programs. (2019). Congressional Research Service. https://crsreports.congress.gov/product/pdf/R/R44416

Tribal Consultation: Additional Federal Actions Needed for Infrastructure Projects (GAO-19-22; pp. 7, 87). (2019). United States Government Accountability Office. https://www.gao.gov/assets/gao-19-22.pdf

Tribal Energy Project Funding History. (n.d.). Energy.Gov. Retrieved April 23, 2021, from https://www.energy.gov/indianenergy/projects/tribal-energy-project-funding-history

Tribal Energy Project Successes. (n.d.). Energy.Gov. Retrieved April 23, 2021, from https://www.energy.gov/indianenergy/projects/tribal-energy-project-successes

Tribal Energy Projects Database. (n.d.). Energy.Gov. Retrieved April 21, 2021, from https://www.energy.gov/indianenergy/tribal-energy-projects-database

Tribal Energy Resource Agreements (TERAs): Approval Process and Selected Issues (No. R46446). (2020). Congressional Research Service. https://crsreports.congress.gov/product/pdf/R/R46446

Tribal Land and Ownership Statuses: Overview and Selected Issues for Congress. (2020). Congressional Research Service. https://fas.org/sgp/crs/misc/R46647.pdf

Energy Development Impact on Indigenous Peoples, (2017) (testimony of University of New Mexico School of Law & Natural Resources and Environmental Law Clinic). https://lawschool.unm.edu/events/united-nations/docs/energy-development-impact-on-indigenous-peoples-final-report.pdf

US Census Bureau. (n.d.). *Navajo Nation Tribal Area*. Retrieved April 22, 2021, from https://www.census.gov/tribal/?st=04&aianihh=2430

U.S. Economic Development Administration. (n.d.). *EDA Performance Measurement and Program Evaluation: EDA Investments FY2012-2018*. Retrieved May 11, 2021, from https://eda.gov/performance/

US Energy and Employment Report: 2017 County Level Data. (2017). BW Research Partnership. https://www.usenergyjobs.org/research

USEER: Wages, Benefits, and Change. (2021). Energy Futures Initiative, BW Research Partnership, NASEO. https://static1.squarespace.com/static/5a98cf80ec4eb7c5cd928c61/t/606d1178a0ee8f1a53e66206/1617760641036/Wage+Report.pdf

Walker, D. (2021, January 26). *Oil-reliant tribes ask for exemption*. Indian Country Today. https://indiancountrytoday.com/news/oil-reliant-tribes-ask-for-exemption

What Is Holding Back Renewable Energy Development in Indian Country? (2019, December 11). Clean Energy Finance Forum. https://cleanenergyfinanceforum.com/2019/12/11/what-is-holding-back-renewable-energy-development-in-indian-country

What is the Tribal Energy Development Capacity (TEDC) Grant? | Indian Affairs. (n.d.). Retrieved May 12, 2021, from https://www.bia.gov/service/grants/tedc/what-tribal-energy-development-capacity-tedc-grant

Workforce Development: Gila River Indian Community. (2017). National Congress of American Indians. Another example is the Chickasaw Nation which created a School to Work Program that will provide higher education and on the job training.

Workforce Development in Indian Country: The Challenges. (n.d.). NCAI. https://www.ncai.org/ptg/WDEV_TOOLKIT_-_Challenges_Expanded.pdf

Young, J., & Lee, V. (2016). *PV Solar Power for the Santo Domingo Tribe's Community Water Pump and Treatment Facility*. https://www.energy.gov/sites/default/files/2016/12/f34/Young-santo-domingo.pdf