2022 NEW MEXICO STATE ENERGY SECURITY PLAN

Acknowledgments:

For more information about New Mexico's Energy, Minerals and Natural Resources Department (EMNRD), visit the following website: **https://www.emnrd.nm.gov/**

The New Mexico State Energy Security Plan was developed through the leadership of the New Mexico Energy, Minerals and Natural Resources Department's Energy Conservation and Management Division. This plan is an update to the New Mexico Energy Assurance Plan and is intended to meet the requirements set out by the Infrastructure Investment and Jobs Act, signed into law by President Biden on November 15, 2021. This update included collaboration with the New Mexico Department of Homeland Security and Emergency Management and the New Mexico Public Regulation Commission along with other federal, state, and local government agencies, public and private utilities, and private businesses.

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LIST OF ACRONYMS

BTU – British Thermal Unit
CESER – Office of Cybersecurity, Energy Security, and Emergency Response (U.S. Department of Energy)
CISA – Cybersecurity and Infrastructure Security Agency (U.S. Department of Homeland Security)
DHS – Department of Homeland Security
DHSEM – New Mexico Department of Homeland Security and Emergency Management
DOE – U.S Department of Energy
ECMD – Energy Conservation and Management Division (New Mexico Energy, Minerals, and Natural Resources Department)
EEAC – Energy Emergency Assurance Coordinator
EERE – Energy Efficiency and Renewable Energy (U.S. Department of Energy)
EIA – U.S. Energy Information Administration
EM – Emergency Manager
EMAC – Emergency Management Assistance Compact
EMNRD – New Mexico Energy, Minerals and Natural Resources Department
EOC – New Mexico Emergency Operations Center
EPA – U.S. Environmental Protection Agency
ESF – Emergency Support Function
FAST – Fixing America's Surface Transportation
FBI – Federal Bureau of Investigation
FEMA – Federal Emergency Management Agency (U.S. Department of Homeland Security)
FEMP – Federal Energy Management Program (U.S. Department of Energy)
GAR – Governor's Authorized Representative
HSAS – Homeland Security Advisory System
ICS – Incident Command System
IMT – Incident Management Team (state response team)
IMAT – Incident Management Assistance Team (federal assistance team)
JFO – Joint Field Office
JIS – Joint Information Center
NCIJTF – National Cyber Investigative Joint Task Force
NIMS – National Incident Management System
NMASIC – New Mexico All Source Intelligence Center, also known as the New Mexico Fusion Center
NOC – National Operations Center
NRF – National Response Framework
NTAS – National Terrorism Advisory System
OE – Office of Electricity (U.S. Department of Energy)
PHMSA – Pipeline and Hazardous Materials Safety Administration (U.S. Department of Transportation)
PIO – Public Information Officer
POC – Point of Contact
PRC – New Mexico Public Regulation Commission
PSB – Pipeline Safety Bureau (NM Public Regulation Commission)
RRCC – Regional Response Coordination Center
SESP – State Energy Security Plan
SCO – State Coordinating Officer
SSA – Sector Specific Agency
UD – Utilities Division (NM Public Regulation Commission)

EXECUTIVE SUMMARY

Part I of this New Mexico State Energy Security Plan (SESP) is a supplement to the New Mexico All-Hazard Emergency Operations Plan and Emergency Support Function #12 – Energy Annex. It expands current information on agency roles, responsibilities and authorities in an energy emergency event that progresses from a minor disruption to a declared energy emergency. It also describes decision-making processes, actions and resources used in response to an event. The Energy Emergency Assurance Coordinator Team, with assigned responsibilities during an energy emergency event, has been integrated into the plan as outlined in section A.3. A listing of key New Mexico energy providers is also provided in Appendix 1, intended to be a resource prior to and during an energy emergency. It is recommended that an energy disruption training exercise be performed to assess the processes and roles defined in this plan.

Part II presents an overview of the state's energy assets (electricity, natural gas, petroleum, propane, coal) along with their sources and uses and provides an insight to the state's independence or dependency on external sources for energy. Natural gas and coal currently provide most of the state's energy resources for electricity generation at 73% with renewables (wind, solar) significantly increasing in production over the past 5-10 years at 27%. The transportation sector consumes more than four-fifths of all petroleum used within the state. Assuring the operation of the energy transportation assets (transmission lines for electricity and pipelines for petroleum and natural gas) and the one remaining oil refining facility is important to the state's energy security based on system vulnerabilities. Many physical and operational assurance monitoring indicators are currently being tracked, yet the same was not found for cyber assurance indicators.

Part III includes information regarding critical infrastructure, critical energy infrastructure, and interdependencies between energy and other infrastructures. The New Mexico energy sectors are relatively robust and resistant to single failure and most high potential man-made events, excluding cyber-attack. Significant interdependencies exist between fuel, electricity and water that leave the energy sector vulnerable to cascading events. While the state has not sustained a significant cascading failure between the infrastructure sectors even when impacted by severe weather events, the 2011 Freeze Event, as discussed in Appendix 6, did require compensatory actions by utility companies to prevent both a failure in the natural gas sector and electric sector. Age-related deterioration and wildfires pose the greatest dangers to critical energy infrastructure based on their high potential and degree of impact. Cyber threats to all energy sectors are an area of concern and should be protected against as these threats continue to be prolific and sophisticated. Due to the pandemic threat, supply chain impacts have also become more pervasive in the past two years which can lead to lack of equipment and materials for restoration along with shortages of skilled labor. A proactive recommendation to aid in managing natural gas and petroleum supplies to sustain critical services during disruptions is to establish agreements which stipulate the delivery of certain quantities of supply and upper limits of prices from key providers.

It is recommended that a more detailed analysis of threats, vulnerabilities, and risks to the energy sectors, and development of mitigation actions for identified vulnerabilities be performed to assure/secure New Mexico's energy assets and functions in the future. Such analyses would inform actions that could be taken to prevent potential failures to the state's critical infrastructure and address interdependencies between the energy sectors and the potential for cascading failures. The EEAC Team in partnership with private sector energy providers is well positioned to lead further analysis of the energy sectors and coordinate an exercise to test elements of this plan.

PART I. ENERGY EMERGENCY EVENT OPERATIONAL ELEMENTS

Part I of this State Energy Security Plan is intended as a resource for state agencies involved in an energy emergency event. It provides information on agency roles, responsibilities and authorities in an energy emergency event that progresses from a minor disruption to a declared energy emergency and activation of the state Emergency Operations Center (EOC). The New Mexico Department of Homeland Security and Emergency Management (DHSEM) operates the state's EOC. Chapter A presents state agency roles and responsibilities while Chapter B summarizes federal agencies that may provide planning support or be involved during an energy emergency. Chapter C provides information on how an event would progress from a non-emergency to an emergency condition. It also describes the decision processes, entity roles, actions and resources used to respond to an event. Chapter D addresses emergency communication procedures, both internal and external, during an energy emergency event and Chapter E provides an overview of the New Mexico energy sector enterprise. This plan is a supplement to and follows the operational procedures and roles defined in the State of New Mexico All-Hazard Emergency Operations Plan.[1]

Chapter A. State Entities, Roles, and Contact Information

This chapter provides information on New Mexico state agencies/representatives involved in an energy event along with their roles and contact information. Figure 1 depicts the state agencies and positions involved in a declared energy emergency. Table 1 provides summary information for the state entities involved in an energy event and their roles in both non-emergency and declared emergency situations.

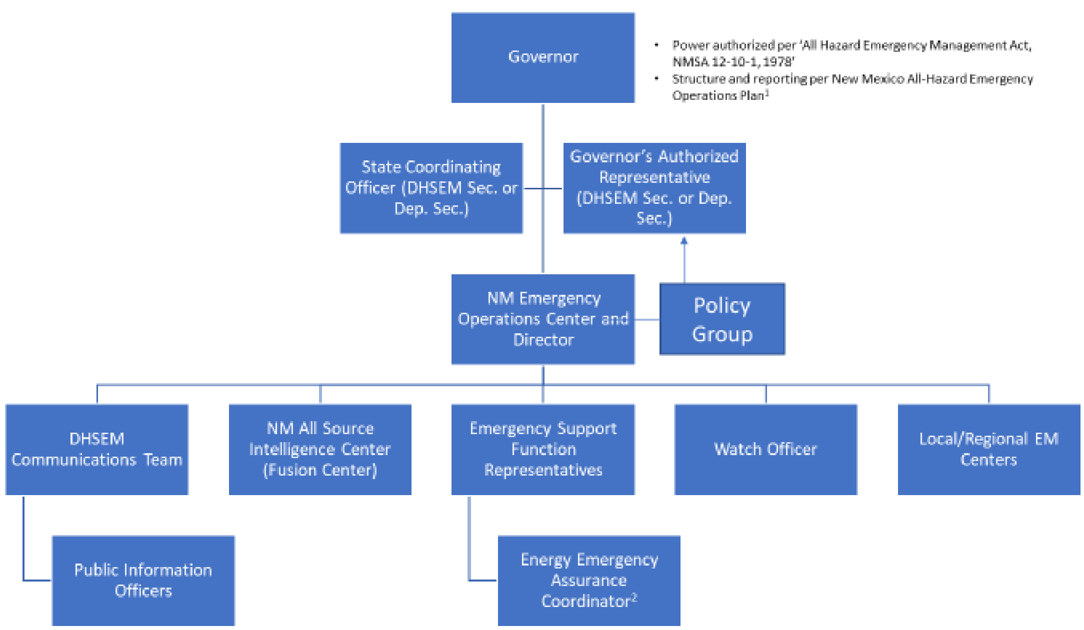

Figure 1: Incident Reporting Structure for an Energy Emergency Event[2]

[1] State of New Mexico All-Hazard Emergency Operations Plan, Revised December 2021.
[2] The Energy Emergency Assurance Coordinator (EEAC) Team is comprised of representatives from several state agencies. This team and its roles are more fully explained in Part I.A.3

Table 1: Summary of State Entity Roles and Points of Contact in Non-emergency and Emergency Situations

Entity/Role	POC	Pre-Emerg. Role	Emerg. Role	Role Description
Governor	Phone: 505-476-2220 Email: diego.arencon@state.nm.us	No	Yes	Declares a state emergency to activate state Emergency Operations Center. See activation levels, Table 2, Part I.C.2.
Governor's Authorized Representative **DHSEM Secretary**	Secretary: David Dye Phone: 505-476-9655 Mobile: 505-589-8158 Email: david.dye@state.nm.us Dep. Secretary may serve as the Secretary's delegate.	No	Yes	Serves as Governor's delegated representative during an emergency. Activates/Deactivates the EOC levels. Serves as the State Coordinating Officer to interface with the Federal Emergency Management Agency (FEMA) Federal Coordinating Officer during a declared emergency where federal resources are requested.
Emergency Operations Center Director	Phone: 505-476-9635 Email: nm.eoc@state.nm.us	No	Yes	Directs and controls EOC operations, response, and resources, once EOC is activated. Key POC for federal assistance and interstate mutual aid requests. Responsible for support to field Incident Response Teams. Interfaces with PIO on emergency communications to the public.
EOC Watch/Duty Officer	Phone: 505 476-9635 Email: nm.eoc@state.nm.us	Yes	Yes	Monitors 24/7 request line for state-level EOC support and recommends activation of the EOC to EOC Director. Staff monitors conditions for potential events and energy disruption.
EMNRD/ECMD **EEAC Representative**	Phone: 505 476-3457 Email: erin.taylor@state.nm.us Backup Phone: 505-629-2858 Email: jacqueline.waite@state.nm.us	Yes	Yes	Monitors energy sector status and information for potential disruption. (Pre-emergency) Informs EOC and Governor's Office of an energy disruption that has the potential to become an energy emergency. (Pre-emergency) Leads EEAC Team for energy security pre-planning efforts and ESF #12 (Energy) activation in the event of emergency. Monitors emergency event and coordinates EEAC Team information and assistance from support agencies and federal partners.

PRC **EEAC Representatives**	**Pipeline Safety Bureau** Phone: 505-946-8314 Email: jasonn.montoya@state.nm.us **Utilities Division** Phone: 505-670-4360 Email: jack.sidler@state.nm.us	Yes	Yes	POC with state-regulated providers on state efforts with energy security, conservation, efficiency, emergency preparedness and exercises. (Pre-emergency) Primary POC with the EOC during an event providing information, support, assessment, and recommendations. Interface with regulated electric power providers and pipeline operators during an event on situational awareness and assessment of needs for support.
Fusion Center	Phone: 505 -250-5739 Email: intelligence.fusion@state.nm.us	Yes	Yes	Monitors for threats or trends to energy sectors, primarily man-made or terrorist related, and provides situational awareness to EEAC Team. (Pre-emergency) Provides analysis support on risks and vulnerabilities, specifically cyber. (Pre-emergency) Supports analysis and situational awareness for EEAC Team and EOC Director during an event. Key interface with CESER, CISA and FBI during a cyber event.
Policy Group	EOC Director is the point of contact	No	Yes	Provides support to EOC and Governor's Office during an event on policy issues, Executive Orders, and waiver needs.
FEMA	Phone: 202-646-2500 800-621-3362	No	Yes	Assists state EOC resource at the request of the State Coordinating Officer (DHSEM Secretary) and state EOC Director. Provides financial assistance to recover from an emergency after a Federal Disaster declaration by the President.

A directory of contacts for New Mexico energy providers is provided in Appendix 1.

A directory of emergency managers across New Mexico is provided in Appendix 2.

Information regarding roles and legal authorities for each state entity are include in Parts I.A.1 through Part I.A.4 and additional details regarding statutes, laws, etc. are included in Appendix 7.

A.1 GOVERNOR'S OFFICE

The Governor is responsible for the safety and welfare of New Mexico's citizens and visitors and as such has primary direction, control, and coordination of the Department of Homeland Security and Emergency Management (DHSEM) Emergency Operations and all state resources during a declared emergency event under the provisions of the All-Hazard Emergency Management Act[3].

The Governor may declare a state of emergency and activate the New Mexico EOC or can be advised to activate the EOC by the DHSEM Secretary.

Governor's Authorized Representative (GAR) and State Coordinating Officer (SC0)

The DHSEM Secretary or Deputy Secretary, at the request of the Governor, serves as the Governor's Authorized Representative (GAR) and fulfills the Governor's duties during a declared state emergency. The DHSEM Secretary is also designated as the State Coordinating Officer (SCO) during a declared major disaster or emergency requiring assistance or coordination with the federal government through the Federal Emergency Management Agency (FEMA) and is the primary contact between the FEMA appointed Federal Coordinating Officer, State of New Mexico officials, and local officials.

A.2 NEW MEXICO DEPARTMENT OF HOMELAND SECURITY AND EMERGENCY MANAGEMENT (DHSEM)

The DHSEM Secretary activates the New Mexico EOC by notifying the EOC Director. The Secretary is authorized to change the EOC's activation level during an event based upon the situation and response needs and de-activates the EOC when response and short-term recovery operations have been completed. The Secretary serves as the communications conduit from the EOC to the Governor's Office, interacts with the senior management of FEMA Region 6, and establishes the EOC's response and recovery priorities.

One or more representatives from the DHSEM serve as members of the Energy Emergency Assurance Coordinator (EEAC) Team. See EEAC Team and Roles in Part I.A.3 for a description of responsibilities prior to and during an energy emergency

Emergency Operations Center (EOC) Director

The EOC Director is responsible for the direction, control, and coordination of the EOC. The EOC Director determines the general control objectives, staffs the EOC, and oversees EOC operations in support of an incident response. EOC operations are governed by the New Mexico All-Hazards Emergency Operations Plan.

The EOC Director provides situational information and updates to the Secretary, or Policy Group, at regular intervals during each shift. During EOC activation, the EOC Director recommends to the Secretary the need to request State Executive Orders, waivers, or federal assistance and works with FEMA Region 6 and Emergency Support Function representatives on operational issues.

EOC Watch/Duty Officer

The EOC Watch/Duty Officer position staffs the EOC 24 hours a day, 365 days a year and monitors activities within the state for requests for support from the EOC. The EOC Duty Officer may also advise DHSEM management to activate the EOC if a request from a local, regional, or county emergency manager warrants such action.

Policy Group

The DHSEM Secretary may convene the Policy Group to deliberate on policy and legal issues that arise in a complex, multi-agency response to an emergency or disaster. The Policy Group advises the EOC Director to ensure coordinated incident planning and operations and may also be involved in decisions regarding waivers to regulations or laws and development of executive orders to support an energy emergency. Members of

[3]New Mexico Statutes Chapter 12, Article 10 (2020) - All Hazard Emergency Management

the Policy Group generally include the Governor's Chief of Staff, Cabinet Secretaries, legal counsel of state agencies, and senior officials of other involved agencies and jurisdictions, as warranted.

New Mexico All Source Intelligence Center (Fusion Center)

The New Mexico All Source Intelligence Center (NMASIC), or the New Mexico Fusion Center, is collocated with the EOC. The center is operational around the clock though not necessarily always staffed. NMASIC's responsibilities and duties include forecasting and identifying emerging or evolving threats or trends; collecting, evaluating, analyzing, and disseminated information; and providing situational awareness and warnings. The Fusion Center's expertise lies with man-made events, specifically cyber, and coordinates with federal agencies to determine the extent of the event and recommended actions. The Fusion Center is also a resource to energy providers for system vulnerability analyses as preventive measures to cyber events.

NMASIC members participate in EOC briefings during emergency events to assimilate and analyze information and update staff on unclassified information. The Fusion Center may provide information on critical infrastructure issues; support Emergency Support Function (ESF) #13 (Public Safety and Security) and ESF #2 (Communications); and interact with the EEAC Team, the EOC Director, and the Policy Group.

A.3 NEW MEXICO ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT (EMNRD), ENERGY CONSERVATION AND MANAGEMENT DIVISION (ECMD)

EMNRD ECMD has been delegated to serve as the New Mexico State Energy Office which has responsibility for monitoring energy sectors across the state, implementing energy conservation measures promulgated by Federal and State acts and statutes and maintaining the SESP.

EMNRD ECMD is also designated as the primary agency for responsibility during an energy emergency per ESF #12, which is the Energy Annex of the New Mexico All-Hazards Emergency Operations Plan. The Energy Emergency Assurance Coordinator (EEAC) Team has been created to fulfill this role. Representatives from ECMD will serve on the Energy Emergency Assurance Coordinator Team with the responsibilities designated under the Energy Emergency Coordinator Team and Roles.

Energy Emergency Assurance Coordinator (EEAC) Team and Roles

EEACs are the POC that the United States Department of Energy (DOE) and other states use to share information during events that disrupt energy supplies or to communicate important emergency notices. The EEAC Program is a cooperative effort between the DOE's Office of Cybersecurity, Energy Security, and Emergency Response **(**CESER) and the states.[4] States are responsible for maintaining and updating EEAC contacts through ISERnet.[5]

New Mexico state agencies have adopted the EEAC structure and role to serve as the ESF #12 primary point of contact. Representatives from EMNRD ECMD, the New Mexico Public Regulation Commission (PRC), and DHSEM EOC serve on the EEAC Team. EEAC Team representatives are also POCs with energy infrastructure owners, utility providers, DHSEM, DOE, FEMA and others concerning state efforts with energy security, energy emergency preparedness, energy conservation and energy efficiency efforts, and facilitating exercises on energy emergencies in concert with DHSEM.

The following list, broken down by pre-emergency and emergency event timeframes, represents responsibilities of the EEAC Team. The listed entity's EEAC Team representatives are primarily responsible for the activity. (Note that DHSEM General Counsel, the Fusion Center, the Policy Group and Governor's Office

[4] https://www.naseo.org/Data/Sites/1/documents/energyassurance/eaguidelines/guidance-for-the-review-and-updating-energy-emergency-assurance.pdf

[5] https://www.oe.netl.doe.gov/ISERNET/login.aspx?mesg=expired

are also resources for the EEAC Team during any event along with other representative staff from EMNRD, PRC and DHSEM.)

Pre-emergency Roles and Responsibilities of EEAC Team Members

ECMD Representative

- Conduct and lead periodic meetings and conference calls with EEAC team representatives and other support agencies, as needed, to preplan, analyze and prepare for potential events.
- Analyze energy sectors for vulnerabilities and risks.
- Identify system interdependencies and potential cascading failure points for use during an event.
- Identify new equipment or capabilities required to prevent and respond to new or emerging threats and hazards, or to improve the ability to address existing threats.
- Develop recommended energy conservation, reduction, and alternative measures for implementation to mitigate potential events.
- Develop and maintain the New Mexico Energy Security Plan.
- Monitor energy sectors for potential disruption and notification to EOC of a potential event.
- Inform the Governor's Office of potential energy events and recommend implementation of preemptive actions in the event of an energy disruption, as needed. ECMD and/or PRC
- Maintain trained agency personnel to support ESF #12 emergency response and support teams.

PRC Representative

- Coordinate with utilities to preplan for energy disruptions and recommend energy system preventive actions to address risks and vulnerabilities.
- Point of contact with energy sector owners, providers, and other agencies concerning state efforts with energy security, energy cybersecurity, energy conservation, energy efficiency and emergency response preparedness. [6]
- Coordinate with Critical Infrastructure Coordinator, DHSEM to maintain current key Points of Contact (POC) list for energy emergencies for inclusion in the SESP.
- Maintain trained agency personnel to support ESF #12 emergency response and support teams.
- Inform the Governor's Office of potential energy events and recommend implementation of preemptive actions in the event of an energy disruption, as needed.

DHSEM Representative

- Prepare and facilitate emergency training exercises for an energy event.
- Maintain trained agency personnel to support ESF #12 emergency response and support teams.

Energy Emergency Roles and Responsibilities of EEAC Team Members

ECMD Representative

- Monitor event conditions and response efforts and coordinate information and assistance with other state support agencies and federal partners to better understand and respond to the event situation, as needed.

[6] Note that PRC contacts with some energy providers (e.g., natural gas producers, coal producers and transporters, and propane distributors) may be limited. This could present a gap in communications during pre-emergency and emergency situations.

- Coordinate EEAC team efforts during an energy event to integrate information, provide situational awareness, review event for potential cascading failures and critical infrastructure interdependencies, assist with prioritization of service impacts if needed, and collaborate on recommendations for support and solutions during response and recovery operations.
- Provide trained staffing for support to the EOC ESF #12 desk and field operations, when required.

PRC Representative

- Primary POC with EOC during an energy event providing information, support, assessment, and recommendations on actions to respond and recover from an emergency.
- Interface with representatives from utilities and other energy providers to acquire operational information to better understand resource and support needs to properly respond to and recover from the event.
- Provide trained staffing for support to the EOC ESF #12 desk and field operations, when required.
- Provide information on outages and estimates on time to restore utilities to EOC and ESF #12 desk and field operations, as needed.

DHSEM Representative

- Provide trained staffing for support to the EOC ESF #12 desk and field operations, when required.

A.4 NEW MEXICO PUBLIC REGULATION COMMISSION (PRC)

The New Mexico PRC regulates the utilities, telecommunications, and transportation industries to ensure fair and reasonable rates, and to assure reasonable and adequate services to the public as provided by law. The PRC promotes public safety through the offices of the Pipeline Safety Bureau and Transportation Division. The PRC Pipeline Safety Bureau partners with the 811 call center which serves as a communication hub and location coordinating service for all companies and individuals planning ground-disturbing operations.

One or more representatives from the PRC serve as members of the EEAC Team. See Part I.A.3 for a description of EEAC Team roles and responsibilities prior to and during an energy emergency.

Chapter B. Federal Agencies, Roles, and Contact Information

This chapter provides information on federal agencies and their roles with supporting energy security and energy emergency events. An Index of Government Departments and Agencies with contact information is also available through the internet.[7] FEMA is the sole agency directly involved in supporting the EOC in an energy emergency, as discussed in Chapter C below. More information regarding federal assistance is included in Appendix 3. The federal agencies that support cyber security issues and events (the U.S. Departments of Energy and Homeland Security) are discussed specifically at the end of this chapter.

Information regarding roles and legal authorities for each federal entity are include in the following sections and additional references for statutes, laws, and authorities are included in Appendix 6.

B.1 UNITED STATES DEPARTMENT OF HOMELAND SECURITY (DHS)

The U.S. Department of Homeland Security (DHS), as it relates to an energy emergency, is responsible for cybersecurity, infrastructure security and the Federal Emergency Management Agency (FEMA). To reduce the threat of terrorist attacks within the United States DHS established the Homeland Security Advisory System

[7] https://www.usa.gov/federal-agencies/e#current-letter

(HSAS), which rates terrorist threats to federal, state, and local authorities and the public utilizing a system of color codes. The National Terrorism Advisory System (NTAS)[8] effectively communicates information about terrorist threats by providing timely, detailed information. The New Mexico Fusion Center monitors and will receive notifications through this system in the event of an emergency. Specific DHS agencies involved in an energy emergency event include FEMA and the Cybersecurity and Infrastructure Security Agency (CISA).

DHS Federal Emergency Management Agency (FEMA)[9]

Federal assistance in support of state and local efforts is conducted under the authority of the Secretary of Homeland Security in accordance with the National Response Framework (NRF)[10] and the National Incident Management System (NIMS).[11] In most cases federal support is delivered through provisions of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act).[12] The concepts of scalability, flexibility, adaptability, engaged partnership, tiered response, unity of effort through unified command, and readiness to act guide the effort of the NRF to meet the priorities of saving lives, protecting property and the environment, stabilizing the incident and providing for basic human needs. The state can request assistance from FEMA to assess an incident and impacts prior to declaring a federal disaster or emergency. Once the President declares a disaster, funding through FEMA is then available to support response and recovery efforts within the state.

B.2 UNITED STATES DEPARTMENT OF ENERGY (DOE)

The U.S. Department of Energy (DOE) is comprised of many offices that support the nation's energy programs and infrastructure. The Office of Electricity (OE), Office of Energy Efficiency and Renewable Energy (EERE), and Office of Cybersecurity, Energy Security, and Emergency Response (CESER) support energy security and emergency response along with the U.S. Energy Information Administration (EIA).

Office of Electricity (OE)

The DOE Office of Electricity is DOE's lead agency for government interaction with the nation's energy sectors regarding critical infrastructure protection. OE develops and manages the critical infrastructure protection research and development program and leads and coordinates departmental efforts to work with industry, state and local governments on these efforts. The mission of OE is to lead national efforts to modernize the electric grid; enhance security and reliability of the energy infrastructure; and facilitate recovery from disruptions to energy supply.

Office of Energy Efficiency and Renewable Energy (EERE)

The EERE Federal Energy Management Program (FEMP) is the point of contact for State Energy Offices and provides resource information, support, and tools to State Energy Offices when researching and implementing energy efficiency measures and renewable energy sources.

U.S. Energy Information Administration (EIA)

The U.S. Energy Information Administration (EIA) is the statistical and analytical agency within the DOE. The EIA provides recent data and information on energy sector supply, demand, use, trends, and pricing across the United States and for individual states. Information from EIA includes analysis and projections for energy

[8] https://www.dhs.gov/national-terrorism-advisory-system
[9] https://www.fema.gov/
[10] fema.gov. National Response Framework Fourth Edition October 28, 2019. https://www.fema.gov/sites/default/files/2020-04/NRF_FINALApproved_2011028.pdf (October 28, 2019).
[11] fema.gov. National Incident Management System Third Edition October 2017. https://www.fema.gov/sites/default/files/2020-07/fema_nims_doctrine-2017.pdf (October 2017)
[12] fema.gov. Stafford Act - Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended, and Related Authorities (May 2019). See Appendix 4 for more information.

sectors to include monthly and yearly energy forecasts and analysis of energy topics; financial market analysis and financial data for major energy companies; greenhouse gas data, voluntary reporting, and electric power plant emissions; and maps, tools and resources related to energy assets.

B.3 FEDERAL BUREAU OF INVESTIGATION (FBI)

The FBI is the nation's lead federal law enforcement agency for investigating and preventing acts of domestic and international terrorism including cyber-attacks and intrusions. One of the FBI's top priorities is protecting the U.S. against foreign intelligence, espionage, and cyber operations. The National Cyber Investigative Joint Task Force (NCIJTF) leads a task force of more than 30 co-located agencies from the Intelligence Community and law enforcement to investigate and respond to incidents of cyber threats. The NCIJTF is organized around mission centers based on key cyber threat areas and led by senior executives from partner agencies.

B.4 FEDERAL CYBERSECURITY SUPPORT AGENCIES

DOE Office of Cybersecurity, Energy Security, and Emergency Response (CESER)[13]

CESER provides capabilities and support to energy sector partners to advance critical energy infrastructure security and resilience from all-hazards and manages key DOE authorities and responsibilities. These include serving as the Sector-Specific Agency (SSA) for the energy sector, as the coordinating agency for ESF #12 under the National Response Framework and fulfilling DOE responsibilities under the Fixing America's Surface Transportation (FAST) Act.[14]

To meet this mission, CESER's Infrastructure Security and Energy Restoration Division (ISER) applies the Department of Energy's technical expertise to ensure the security, resiliency and survivability of key energy assets and critical energy infrastructure at home and abroad. CESER engages directly with state governments to provide technical support and coordinate emergency response efforts.

DHS Cybersecurity and Infrastructure Security Agency (CISA)[15]

CISA leads the national effort to understand, manage, and reduce risk to our cyber and physical infrastructure. CISA connects stakeholders in industry and government to each other and to resources, analyses, and tools to help them build their own cyber, communications, and physical security and resilience, in turn helping to ensure a secure and resilient infrastructure for the American people. CISA interfaces with the New Mexico Fusion Center.

CISA developed two playbooks: one for incident response and one for vulnerability response.[16] These playbooks provide federal agencies with a standard set of procedures to identify, coordinate, remediate, recover, and track successful mitigations from incidents and vulnerabilities affecting systems, data, and networks. Agencies should use these playbooks to help shape overall defensive cyber operations to ensure consistent and effective response and coordinated communication of response activities. The Incident Response Playbook applies to incidents that involve confirmed malicious cyber activity and for which a major incident has been declared or not yet been reasonably ruled out. The Vulnerability Response Playbook applies to vulnerabilities being actively exploited.

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[13] https://www.energy.gov/ceser/office-cybersecurity-energy-security-and-emergency-response
[14] Energy Security provision within the Fixing America's Surface Transportation Act (FAST Act), December 2015
[15] https://www.cisa.gov/
[16] cisa.gov. Federal Government Cybersecurity Incident and Vulnerability Response Playbooks. https://www.cisa.gov/sites/default/files/publications/Federal_Government_Cybersecurity_Incident_and_Vulnerability_Response_Playbooks_508C.pdf (December 14, 2021)

Chapter C. Methods for Assessing Severity of Events for Escalation and Management Decision Processes During an Event

The following sections provide information on event escalation roles and responsibilities, resources, decision criteria, processes, and tools for use during an energy disruption or energy emergency.

C.1 NON-EMERGENCY EVENT ESCALATION (MONITORING)

The EEACs are accountable for monitoring and assessing the severity of an energy disruption and making recommendations to the Governor's Office and EOC Director as to remedial actions to take in advance of and during an emergency event. As an energy disruption is identified and progresses, constant communication will be required between the EEAC, EOC Director, Fusion Center (for possible terrorist related incidents), activated emergency management groups, and energy sector private and public entities involved to assess the impacts and determine response actions. Figure 2 represents example actions taken by state entities during an energy disruption or energy emergency. Table 2 represents the levels of escalation for activation of the EOC. The EOC and ESF #12 representatives can be activated at any point based on the decision by the EOC Director and DHSEM Secretary.

Many sources are used by the EEAC representatives to monitor and assess an energy emergency. The EIA is a primary source for monitoring energy sector health data and conditions along with information from EAGLE-I, the PRC, energy providers, the Fusion Center, DHS, DOE, and FBI. Systems such as the National Terrorism Advisory System and EAGLE-I also provide valuable notifications to registered members of events. It is very important that the list of energy sector POCs is kept current, and a communication method established to enable easy and quick communication in the event of an energy disruption. Periodic communication with key energy sector POCs during non-emergency conditions is also important so that lines of communication are kept current and familiar. See Appendix 1 for a directory of New Mexico's energy providers.

Before an event rises to the level of a declared emergency (by either the New Mexico Governor or U.S. President) preliminary damage assessments and information on conditions and circumstances are required to understand impacts of an event. The DHSEM Response and Recovery Team coordinates and facilitates these assessments along with FEMA representatives. In addition, this team is responsible for collecting and reviewing response effort cost information from providers through mutual aid agreements for reimbursement.

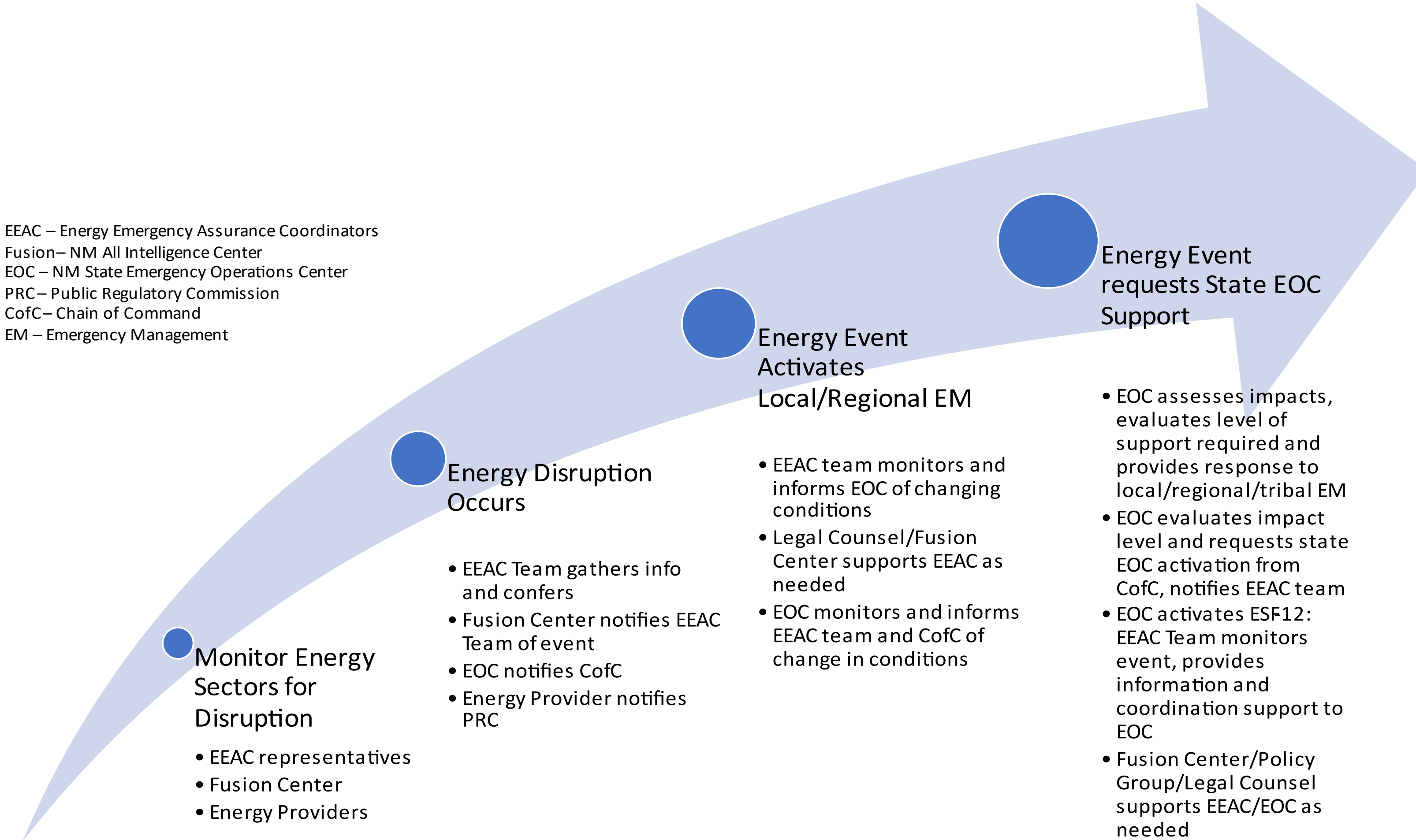

Figure 2: Event Escalation Summary

C.2 EMERGENCY EVENT DECLARATION, IMMEDIATE ACTIONS AND RESPONSIBILITIES

If an energy disruption progresses beyond local/regional/tribal EMs and provider resource capabilities or has a large regional impact, the EOC can be activated by the EOC Director or through notification of the event by any local, regional, or tribal EM who contacts the EOC Watch/Duty Officer and requests assistance from the state EOC. An energy emergency can also be declared by the President of the United States, or the Governor based on national or regional issues or events which will subsequently activate the state EOC.

If activated from a local event escalation, the EOC Watch/Duty Officer will inform their chain of command (EOC Director, DHSEM Secretary, Governor) with a recommendation to activate the EOC in response to the request for assistance. This may include formal or informal activation of members responsible for ESF #12 and can also include informing FEMA and requesting additional assistance from federal sources or requesting assistance from local Region 6 states. Table 2 from the New Mexico All-Hazard Emergency Operations Plan shows activation levels of the EOC.

Once the EOC is activated, the EOC Director is responsible for the direction, control, and coordination of the EOC and state resources assigned for the incident response. The PIO supports the EOC Director during an event and coordinates any public information communication messages. The Operations Section reports to the EOC Director and is responsible for notifying any Emergency Support Function Representatives of resource needs and activation alerts to report to the EOC.

The EEAC PRC representatives will work with the EOC and private energy sector companies and representatives on short-term and long-term actions necessary to address the event to include outage information, measures of reduction, curtailment, prioritization of services, and if assistance from federal or state resources will be required. The EEAC PRC representatives work closely with the EEAC Team representatives on event information assessment and recommendations on actions to take in response, as needed.

The EOC Director, in their capacity as the responsible party to direct and control EOC resources, will make decisions and provide direction to Incident Management Teams and multi-agency support groups, as necessary. Information and intelligence are gathered by many parties other than the EEAC Team including local/regional/tribal EM groups, the Fusion Center, Policy Group, industry representatives, and others, as necessary. Many actions can and will be taken by the local/regional/tribal EM groups and the energy sector owners and providers involving systems under their control. Communications between all parties is essential during these events to properly coordinate response efforts and provide timely information to the PIOs for dissemination to the public and other interested parties.

If an event escalates and requires coordination or mutual aid between New Mexico and surrounding states these transactions will occur through EOC operations under the protocols of the Emergency Management Assistance Compact (EMAC)[17] (NMSA 12-10-14 and 15, 1978) or the Interstate Emergency Response Support Plan (IERSP). The IERSP is a mutual aid agreement between the FEMA Region 6 states of Arkansas, Louisiana, Oklahoma, New Mexico, and Texas that builds upon EMAC by expediting the request and support process during the initial response to a catastrophic disaster occurring within the FEMA Region 6 states. Coordination can occur at many levels including directly cross-border, between corresponding agencies or emergency support functions, and State EOC to State EOC. Activation of interstate and federal assistance through mutual aid agreements will be initiated through EOC processes.

[17] Emergency Management Assistance Compact (EMAC) For more information about EMAC visit www.emacweb.org, contact NEMA (www.nemaweb.org)

State EOC coordination with a federal response depends upon the nature, size, and complexity of the event and the roles of local, state and federal governments. The initial point of response coordination is between the EOC and the Department of Homeland Security FEMA Region 6 Regional Response Coordination Center (RRCC). The RRCC is a standing facility that coordinates regional response efforts, communicates with FEMA Headquarters, establishes federal priorities, and implements federal program support for the state and affected local jurisdictions until a Joint Field Office (JFO) is established in the field. The RRCC also establishes communications between the EOC and the National Operations Center (NOC), coordinates deployment of the Incident Management Assistance Team (IMAT) to field locations, assesses damage information, develops situation reports, and issues initial mission assignments. The IMAT deploys to the State EOC, or affected jurisdiction, to aid in disaster operations management, support the set-up of the JFO (in the case of a Disaster Declaration), and assist with the transition to recovery. See Appendix 4 for a more detailed explanation of the Federal response process in support of a state emergency request, the agencies involved and roles.

LEVEL 4 (Normal Operations)	Level 4 (Normal Operations) is a non-activated status for the EOC involving statewide monitoring of conditions by the Watch and Duty Program. The Watch Program covers business hours in the EOC when not activated while the Duty Program covers nights, weekends, and holidays. EOC operational readiness is maintained by the DHSEM Response and Recovery Bureau. Activities include planning, training, and exercising, situational awareness, low-level operations, and coordinates facility and equipment maintenance.
LEVEL 3	EOC is partially staffed with some positions filled within the ICS structure and several ESFs represented. The Level 3 activation is usually short-term involving one shift per day, but not extended hours of operation. The duty officer monitors the incident overnight. Activities may include situation analysis, alert/notification, limited resource coordination, financial tracking, public information, and other emergency functions. Events that may trigger a Level 3 activation are: weather advisories, an impending winter storm, potential flooding, minor flooding occurring, one or several small wildfire(s) threatening few or no structures, a hail storm, a limited number of evacuations, providing mutual aid during significant local, national, and international events, and a NTAS Elevated Threat Alert from the US Government warning of a credible threat involving New Mexico, but without specific information concerning timing or location.
LEVEL 2	EOC is nearly fully staffed with the ICS positions and multiple ESF representatives. Staffing may involve 2 shifts covering extended hours (such as from 0700 to 2200) and a duty officer overnight. Activities may include situation analysis, incident planning, alert/notification, communications, coordination of resource, public information, coordination of intrastate mutual aid, and financial tracking. Events that may trigger Level 2 activation are: a widespread winter blizzard, a damaging tornado, moderate flooding, a hazardous materials leak prompting large scale evacuations, and a wildfire as well as any event from level 3. EOC is fully staffed with both ICS positions and ESF representatives for long term or 24/7 operations. Activities may include situation analysis, incident planning, alert/notification, communications, resource coordination, public information, coordination of intrastate mutual aid, emergency purchasing, financial tracking, requesting resources through the Emergency Management Assistance Compact (EMAC) or Interstate Emergency Response Support Plan (IERSP), and requesting federal assistance and/or issuance of a federal emergency or disaster declaration. A FEMA Incident Management Assistance Team (IMAT) may also be on site and interfacing with the EOC.
LEVEL 1	EOC is fully staffed with both ICS positions and ESF representatives for long term or 24/7 operations. Activities may include situation analysis, incident planning, alert/notification, communications, coordination of resource, public information, coordination of intrastate mutual aid, emergency purchasing, financial tracking, requesting resources through the EMAC or IERSP, and requesting federal assistance and/or issuance of a federal emergency or disaster declaration. A FEMA IMAT may also be on site and interfacing with the EOC. Events that may trigger a Level 1 activation are: a tornado(s) causing numerous injuries or fatalities; disease causing numerous injuries or fatalities (and the request of the Strategic National Stockpile); a mass evacuation and sheltering operation; a major earthquake; a major wildland-urban interface fire; extensive flooding; and a NTAS Imminent Threat Alert from the US Government warning of a credible, specific, and imminent threat.

Table 2: EOC Activation Levels

C.3 WAIVERS AND EXECUTIVE ORDERS

During energy emergencies, actions may be necessary to mitigate or prevent further impacts from the event. Executive Orders, under the provision of the state's emergency powers, along with federal waivers and other regulatory relief can be used to expedite restoration of affected energy systems. The Policy Group can assist with analysis of state statutes and policy and development of executive orders as needed to support recommended mitigative actions for an event.

The DOE has also compiled information on the key types of emergency regulatory relief available for energy response and recovery efforts as well as examples of past uses. This information is intended to help identify appropriate federal regulatory assistance and federal agency points of contact. The major categories of regulatory relief covered here include:

- Waivers
- Special Permits
- No Action Assurances

The DOE provides guidance and links to specific waivers for different regulatory agencies, see Energy Waivers Library | Department of Energy.[18]

Additional federal contacts for energy events:

a. Fuel Waivers – EPA - Office of Air and Radiation (OAR), Office of Transportation and Air Quality, Compliance Division, Fuels Compliance Policy Center and Office of Enforcement and Compliance Assurance (OECA), Office of Civil Enforcement, Air Enforcement Division, Fuels Enforcement Branch
    a. EPA, working with the Department of Energy, responds quickly to address fuel supply disruptions by issuing emergency waivers of certain fuel standards in affected areas. To obtain information about a fuels waiver requests, during normal business hours, contact the EPA Office of Air Fuels Compliance Policy Center or the Office of Enforcement and Compliance Assurance. Outside of normal business hours, contact the EPA Emergency Operations Center. It is also recommended to work through the EOC using their connection to the Federal Emergency Operations Center to request environmental waivers.
    b. OAR Office of Transportation and Air Quality, Compliance Division, Fuels Compliance Policy Center
        i. Phone: Kurt Gustafson 202.403.4419
        ii. Phone: Madison Le 202.507.3062
    c. OECA Office of Civil Enforcement, Air Enforcement Division
        i. Phone: 202.564.2220
        ii. Email: greene.mary.e@epa.gov
    d. EPA Emergency Operations Center
        i. Phone: 202.564.3850
    e. National Response Center
        i. Phone: 800-424-8802
b. Federal Motor Carrier Safety Administration Waivers
    a. FMCSA Emergency Declarations
        i. Phone: 877.831.2250
        ii. Email: FMCSADeclaration@dot.gov
c. Pipeline and Hazardous Materials Safety Administration (PHMSA) Special Permits:
    a. Requests for emergency special permits should be directed to Pipeline Standards and Rulemaking, USDOT, Pipeline and Hazardous Materials Safety Administration at:
        i. Phone: 202.366.4595;
        ii. Email: phmsa.pipeline-emergencyspecpermit@dot.gov.

[18] https://www.energy.gov/ceser/energy-waivers-library

Chapter D. Emergency and Public Information Communications

There are two chains of communication during an event, internal and external. Communication between all emergency response personnel and teams should be kept internal to the response team and coordinated with the EOC Director to prevent confusion and miscommunication to the public. Formal internal team communications and information collection and sharing will be facilitated using the WebEOC tool. Many other informal forms of communication can and will be used during an incident, such as face-to-face, phone, email, internet visual and voice, text, etc. The EOC also has processes in place for backup communications methods in the event of loss of primary communication modes.

For external communications, the state EOC and its supporting Public Information Officer (PIO) and communications team are the responsible parties for developing messages for publication to external parties. PIOs, coordinating with each other through the Joint Information System (JIS) and the EOC will communicate a synchronized message to the public concerning the emergency. The JIS will coordinate the message provided to the public as well as the activities of the PIOs involved. PIOs from the affected jurisdiction, DHSEM, and the state agencies involved in the response will work together to ensure conflicting information isn't distributed to the public. In the case of a terrorism incident, the FBI will be the lead agency for information about the investigation and may exercise direction and control of the JIS. The PIOs' activities include confirming with the Policy Group and EOC Director the guidance on the release of information, establishing an information release schedule to the media, writing news releases and fact sheets, coordinating news conferences, setting up a media and public inquiry function, and briefing the EOC of significant media events and information. PIO communications on emergency event response activities must be approved by the EOC Director prior to publication.

Chapter E. Energy Sector Overview

E.1 OVERVIEW OF ENERGY USES

New Mexico's energy consumption is summarized in a chart in which the thickness of each line indicates the number of energy units (in trillion British Thermal Units, or BTUs) used for a specific purpose.[19] Figure 3 also includes rejected energy (represented by the light grey lines) which is energy that is lost during conversion from one form to another and is calculated based on sector average efficiencies.[20]

[19] Lawrence Livermore National Laboratory and the U.S. Department of Energy, August 2021. Data is based on DOE/EIA SEDS 2019. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports consumption of renewable resources (i.e., hydro, wind, geothermal, and solar) for electricity in BTU-equivalent values by assuming a typical fossil fuel plant heat rate. The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 0.65% for the residential sector, 0.65% for the commercial sector, and 0.49% for the transportation sector. Totals may not equal sum of components due to independent rounding. LLNL-MI-410527

[20] For example, during the combustion of natural gas and petroleum, some energy is lost in the forms of heat and light.

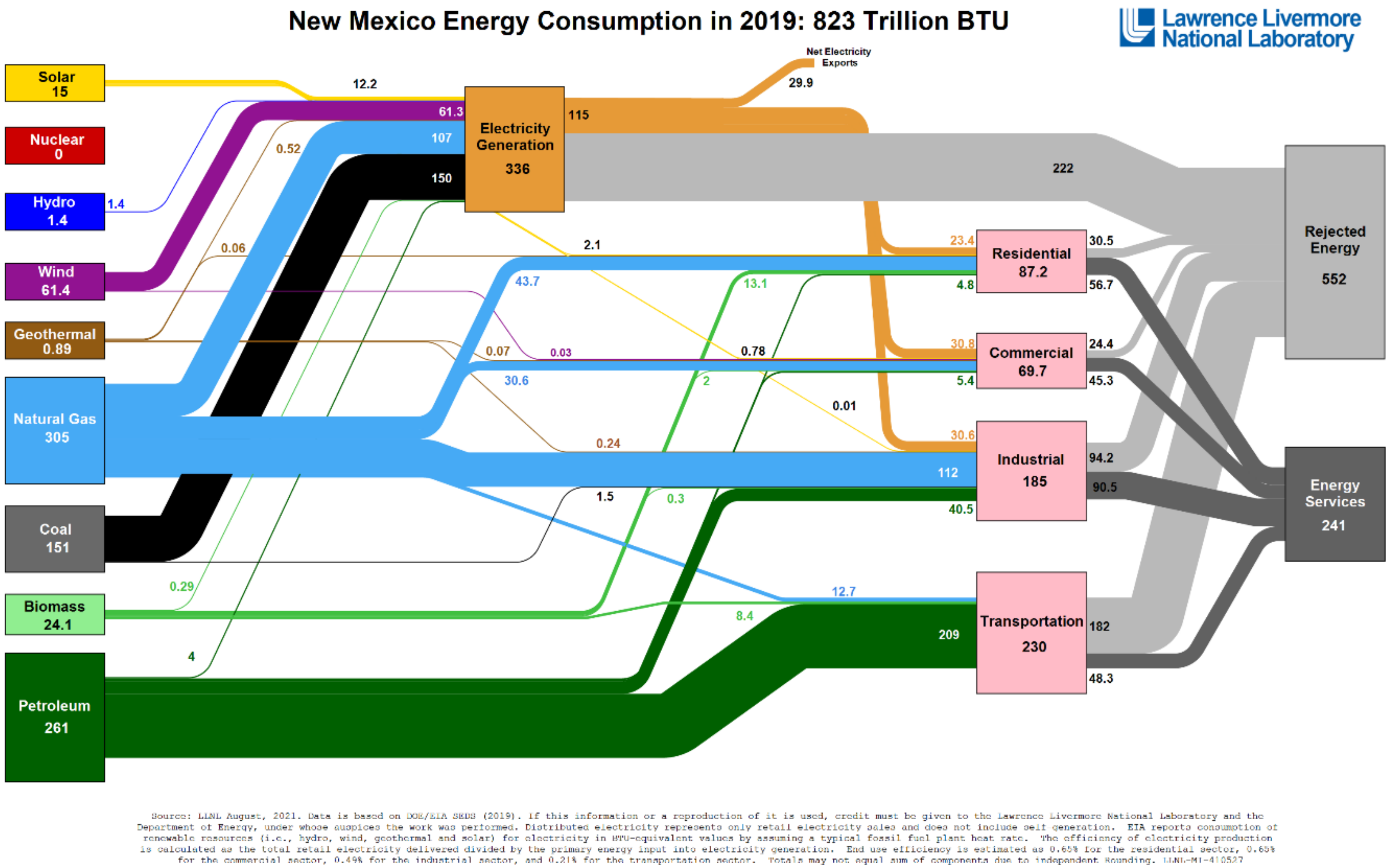

Figure 3: New Mexico Energy Consumption (LLNL and U.S. DOE, see footnote 19)

Several observations related to energy security are worth noting based on Figure 3, namely:

- Industrial and transportation sectors account for 64% of energy consumed in New Mexico.
- In 2019, coal was the dominant electricity fuel source, with natural gas being a significant source and wind and solar contributing some to the production of electricity. (For more details regarding the state's electricity fuel sources, see Part II.A.4.
- Natural gas is a dominant source of energy for the state's industrial enterprises and residential uses.
- Electricity is used by the residential, industrial, and commercial sectors. Electricity does not yet appear in the transportation sector but could in the future due with increases in electric vehicles.

E.2 LOCATIONS OF NEW MEXICO'S ENERGY ASSETS

The state's energy assets are widely distributed, as shown in Figures 4 and 5, with county boundaries overlaid. To customize a map for assets of interest, visit the EIA website.[21] For example, if all energy assets on federal or Indian lands are of interest, a specific map can be easily created by activating the "Administrative Boundaries and Demographics" layer.

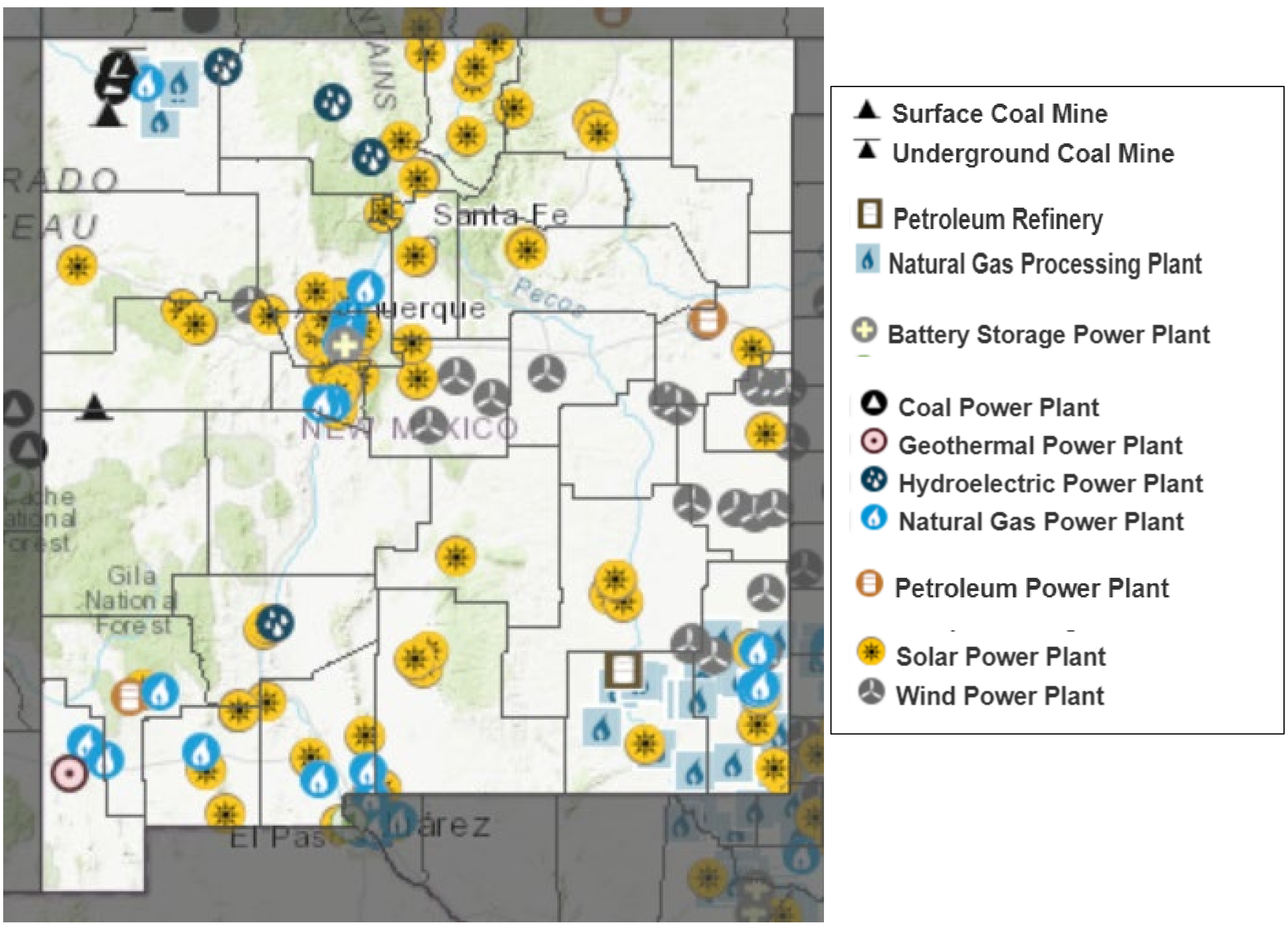

Figure 4: Power Plants, Oil and Gas Processing Sites, and Coal Mines (EIA, accessed April 13, 2022)

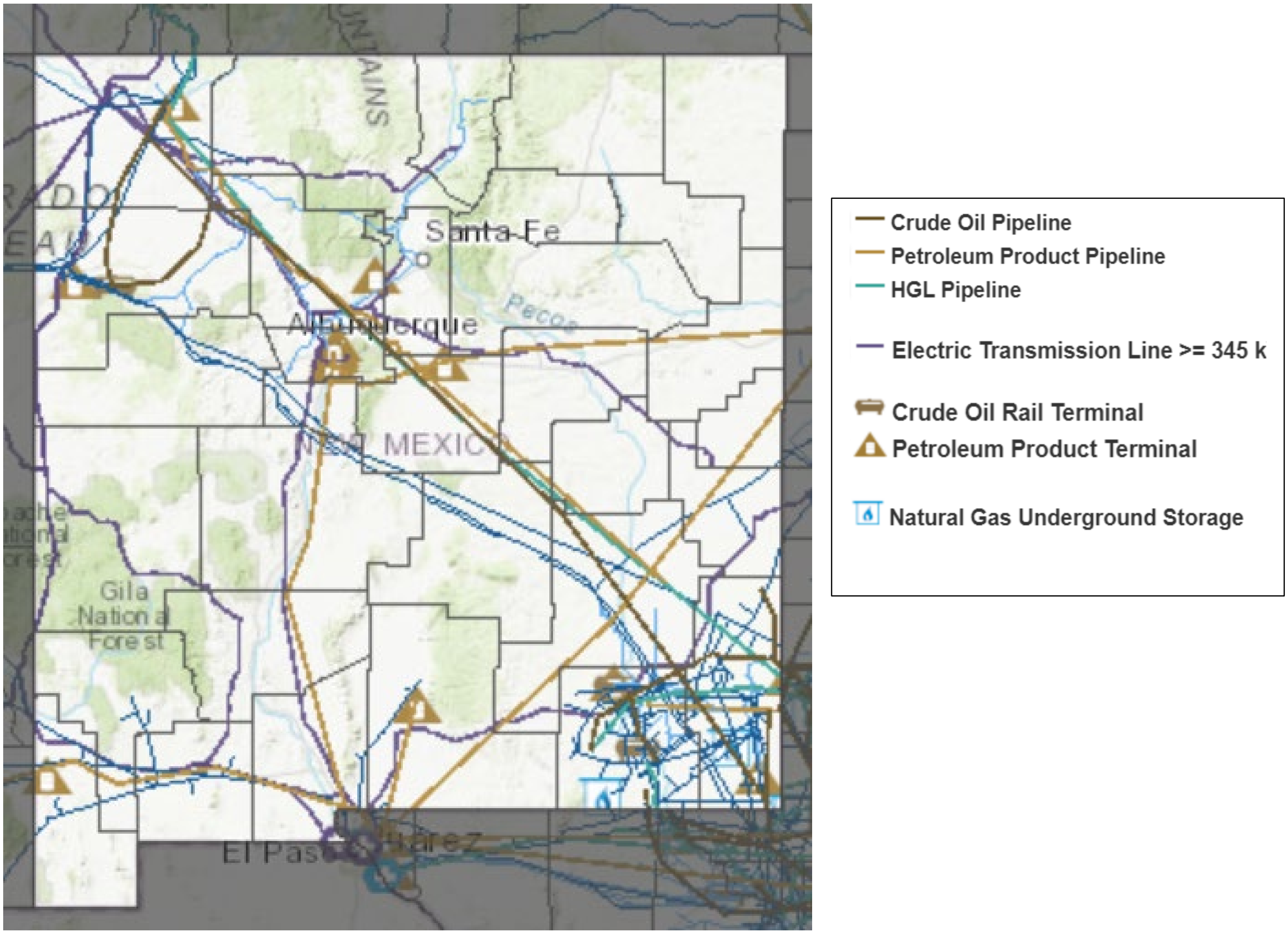

Figure 5: Energy Transmission and Transportation Assets (EIA, accessed April 13, 2022)

Chapter F. Observations

Part I is provided as a supplement to the New Mexico All Hazard Emergency Operations Plan and Emergency Support Function #12 – Energy Annex. This part of the SESP expands on the duties and responsibilities of the entities involved in supporting an energy emergency event and provides information and actions taken prior to the declaration of a state emergency. A recognized federal and state role, the EEAC, has been expanded with assigned responsibilities during an energy emergency event. The EEAC Team roles and responsibilities have been integrated into the plan as outlined in section A.3. Appendix 1 provides a directory of New Mexico energy providers, intended to be a resource prior to and during an energy emergency. It is recommended that an exercise be planned to test the elements of this plan.

PART II. ENERGY SECTOR INFORMATION

Part II of this SESP summarizes the status of the energy enterprise[21] in New Mexico in the 2021 timeframe.[22] The most complete source of statewide data is the U.S. Energy Information Administration (EIA), though different basis years are reported by the EIA for different statistics. This Part includes three chapters. Chapter A summarizes New Mexico's energy sources and their uses as well as locations of energy assets. Specific information about the electricity, natural gas and propane, petroleum, and coal sectors are included. Chapter B is focused on energy system vulnerabilities. Chapter C discusses possible attributes for monitoring the state of health of the energy enterprise in New Mexico. Chapter D includes commentary regarding current energy emergency plans and preparedness activities.

Chapter A. New Mexico Energy Sources and Uses

A.1 OVERVIEW OF ENERGY SOURCES AND PRODUCTION

In 2019, New Mexico was the seventh-largest net supplier of energy to the nation; energy consumption per capita in the state was above the national average; and energy expenditures per capita was below the national average.[23] The state produced energy from predominantly fossil-based sources as shown in Figure 6.[24]

In 2020, New Mexico ranked third nationally in crude oil production, eighth in natural gas production, and twelfth in coal production. The state ranked sixteenth in the nation in installed solar capacity[25] and thirteenth in cumulative installed wind capacity.[26] New Mexico ranked second in uranium reserves in the United States.[27] Energy sources are distributed across the state (See Figure 8.)

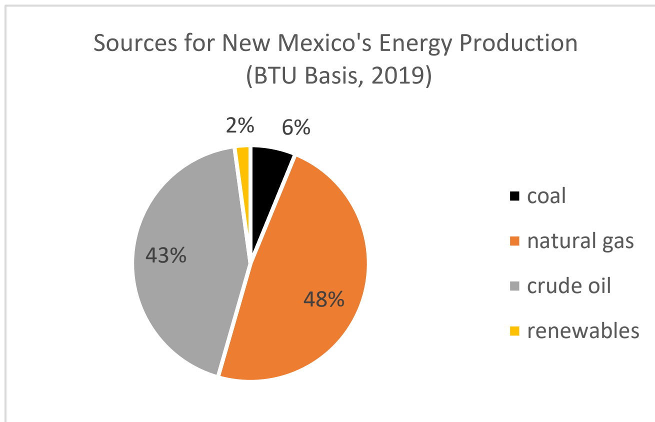

Figure 6: New Mexico Energy Production Sources, (EIA, accessed March 30, 2022)

A.2 OVERVIEW OF ENERGY USES

New Mexico's energy consumption is summarized in Figure 7 in which the thickness of each line indicates the number of energy units (in trillion British Thermal Units, or BTUs) used for a specific purpose.[28] Figure 7 also

[21] The "energy enterprise" in New Mexico is the business of extracting, harvesting, converting, transporting, and using energy resources and includes the management of by-products associated these activities. Business elements include physical, human, financial, and regulatory infrastructures – many of which have interdependencies with local, state, regional, tribal, federal, and global systems.

[22] The most complete source of statewide data is the U.S. Energy Information Administration, though different basis years are reported by the EIA for different statistics.

[23] New Mexico energy consumption per capita in 2019 was 350 million BTU and expenditures per capita were $3790. The national averages are 306 million BTU and $3728, respectively. New Mexico ranks 18th in energy consumption per capita (a ranking of "1" indicates the state with the highest energy consumption per capita) and 27th in energy expenditures per capita. (U.S. Energy Information Administration, 2021)

[24] Data are based on a common unit of energy, the British Thermal Unit. Energy production in New Mexico from all sources in 2019 was 4327 trillion BTU and consumption was 736 trillion BTU. Crude oil production in 2019 in New Mexico was 332 million barrels, natural gas marketed production was 1,948,168 million cubic feet, coal production was 10.2 million short tons, and renewable production was 7.5 million megawatt-hours. Note that New Mexico's crude oil production in 2021 was 460 million barrels. (U.S. Energy Information Administration, 2021)

[25] Solar Energy Industry Association, Solar Insight Market Report, 2021

[26] U.S. Department of Energy, Land-Based Wind Market Report: 2021 Edition

[27] U.S. Energy Information Administration, 2021

[28] Lawrence Livermore National Laboratory and the U.S. Department of Energy, August 2021. Data is based on DOE/EIA SEDS 2019. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports consumption of renewable resources (i.e., hydro, wind, geothermal, and solar) for electricity in BTU-equivalent values by assuming a typical fossil fuel plant heat rate. The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 0.65% for the residential sector, 0.65% for the commercial sector, and 0.49% for the transportation sector. Totals may not equal sum of components due to independent rounding. LLNL-MI-410527

includes rejected energy (represented by the light grey lines) which is energy that is lost during conversion from one form to another and is calculated based on sector average efficiencies.[29]

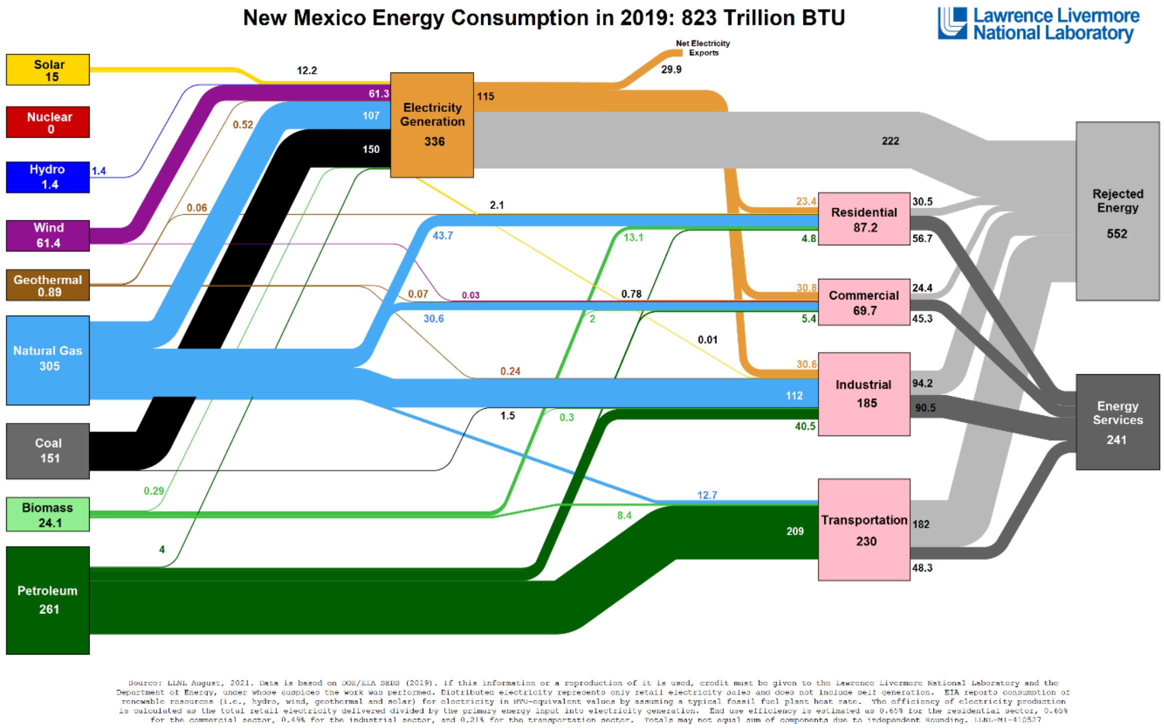

Figure 7: New Mexico Energy Consumption (LLNL and U.S. DOE, see footnote 31)

Several observations related to energy security are worth noting based on Figure 7, namely:

- Industrial and transportation sectors account for 64% of energy consumed in New Mexico.
- In 2019, coal was the dominant electricity fuel source, with natural gas being a significant source and wind and solar contributing some to the production of electricity. (For more details regarding the state's electricity fuel sources, see Figure 10.)
- Natural gas is a dominant source of energy for the state's industrial enterprises and residential uses.
- Electricity is used by the residential, industrial, and commercial sectors. Electricity does not yet appear in the transportation sector but could in the future due with increases in electric vehicles.

A.3 LOCATIONS OF NEW MEXICO'S ENERGY ASSETS

Two databases are available to assist emergency responders with locating the state's energy assets. One is federally maintained data via the EIA and the other, which is focused on physical energy assets, is maintained by the New Mexico 811 "one call" center.[30] Examples of EIA data are shown in Figures 8 and 9, with county boundaries overlaid. To customize a map for assets of interest, the reader is directed to https://www.eia.gov/state/?sid=NM. For example, if all energy assets on federal or Indian lands are of interest, a specific map can be easily created by activating the "Administrative Boundaries and Demographics" layer.

[29] For example, during the combustion of natural gas and petroleum, some energy is lost in the forms of heat and light.
[30] The New Mexico PRC's Pipeline Safety Bureau has direct access to the New Mexico "One Call" center's executive management.

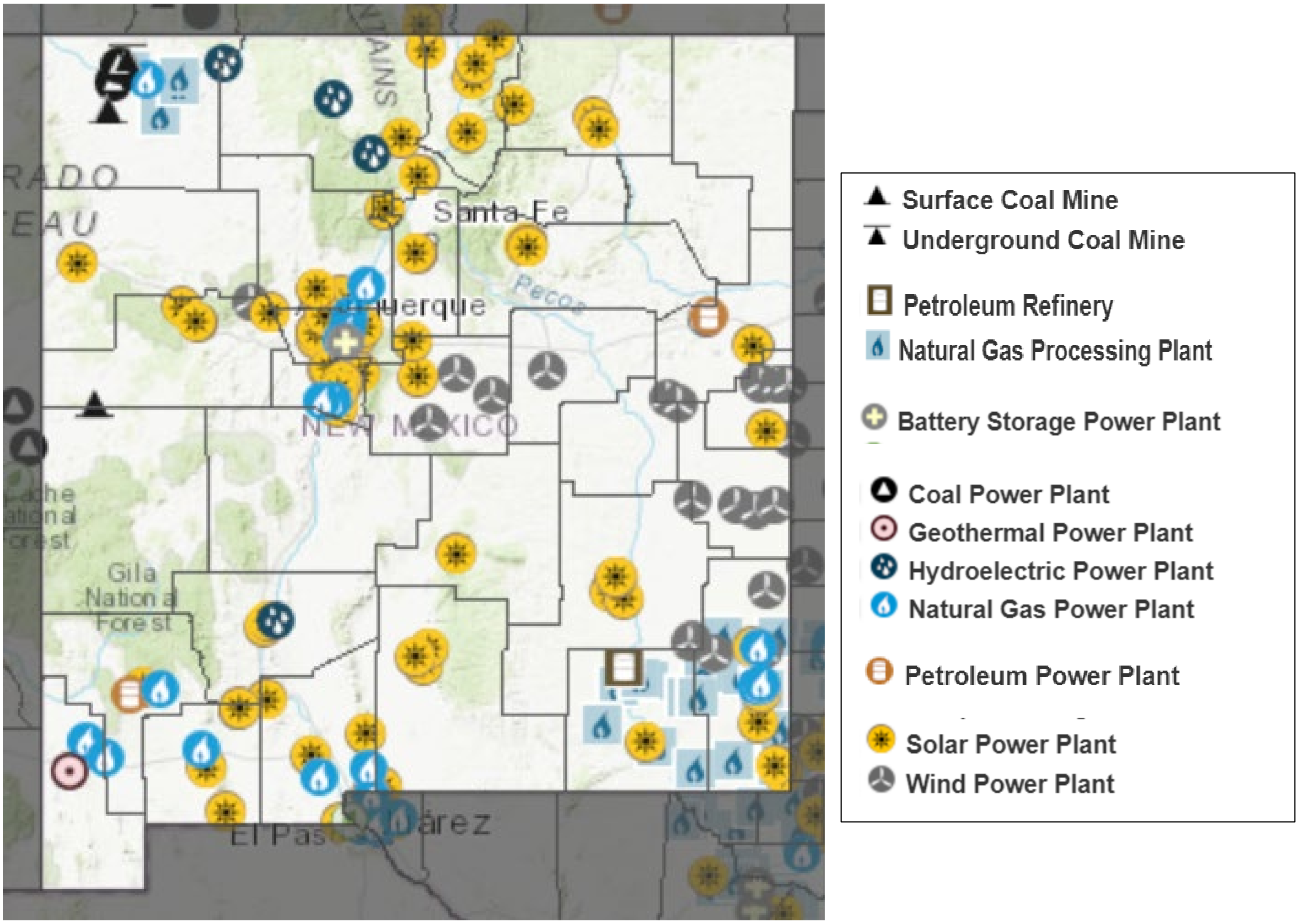

Figure 8: Power Plants, Oil and Gas Processing Sites, and Coal Mines (EIA, accessed April 13, 2022)

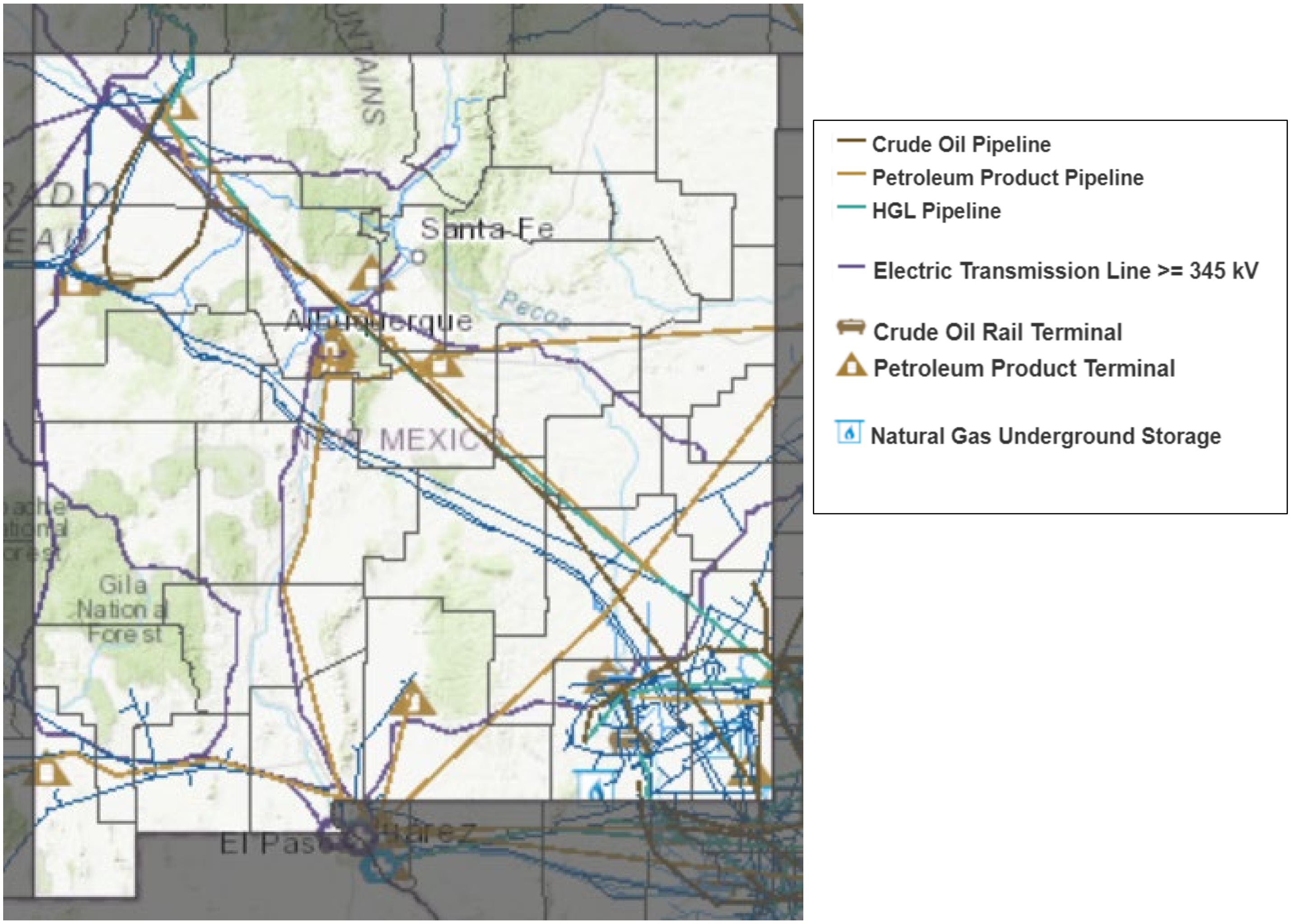

Figure 9: Energy Transmission and Transportation Assets (EIA, accessed April 13, 2022)

A.4 ELECTRICITY SECTOR

Sources and Providers

This section contains a more complete picture of the electricity enterprise in New Mexico. Total net electricity generation in the state in 2020 was approximately 34 million megawatt-hours and the electric power net summer capacity that same year was over 9,000 megawatts.[31] Figure 10 shows the sources used to generation electricity in the state in 2020 and Figure 11 depicts the shifts that have occurred in these sources.

[31] This is total electric capacity in New Mexico. A portion of this capacity is privately generated and not necessarily available for dispatch to the grid.

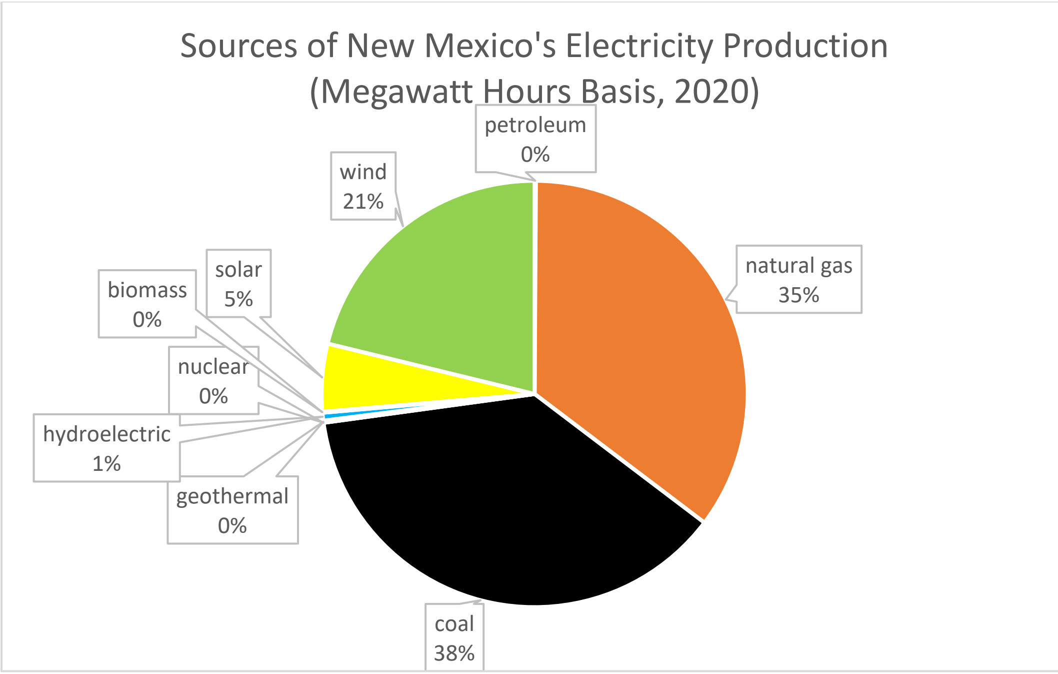

Figure 10: New Mexico Electricity Production, 2021 (EIA, accessed March 30, 2022)

Sources for New Mexico's electricity production have changed in the past 20 years. Production from coal has declined while natural gas, wind, and solar based production has increased. The New Mexico Energy Transition Act of 2019 sets a goal of achieving zero-carbon emissions for electricity produced in the state by 2045. Percentages shown in Figure 10 are based on megawatt-hours of electricity produced. Renewable energy (geothermal, hydroelectric, biomass, solar and wind) sources were harnessed to create 8.7% of New Mexico's electricity in 2015, which has grown to approximately 27.2% in 2020.[32]

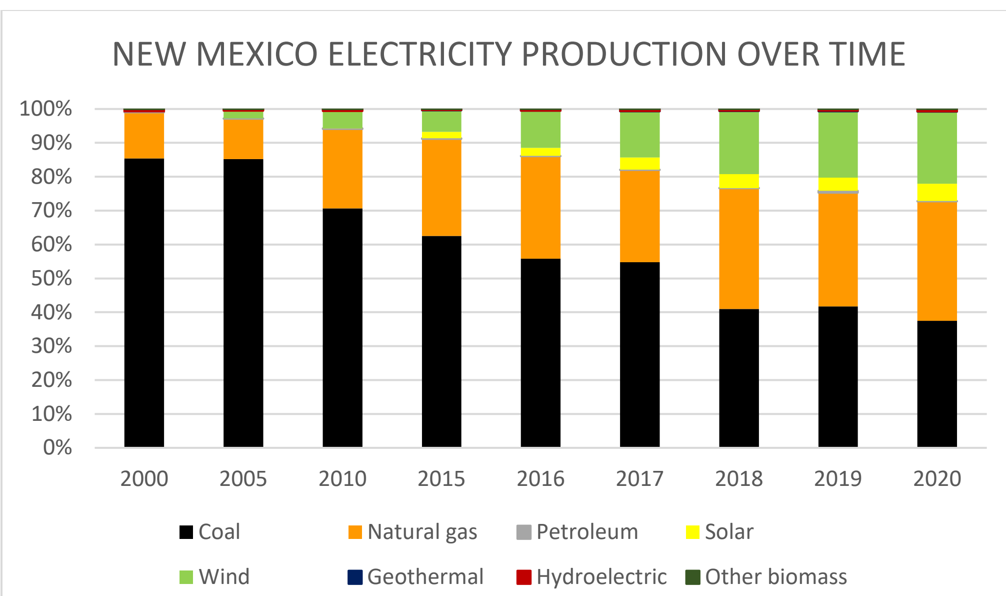

Figure 11: New Mexico Electricity Production, 2000-2020 (EIA, accessed March 30, 2022)

[32] U. S. Energy Information Administration, 2021

The state's 10 largest power plants (based on generation, not nameplate capacity) are shown in Table 3.

Table 3: Largest Power Generation Plants in New Mexico in 2020. (Note: electricity produced by the Four Corners Plant is exported to customers outside of New Mexico.)

	Plant	Primary energy source	Operating company	Generation (MWh)
1	Four Corners	Coal	Arizona Public Service Co	7,598,973
2	San Juan	Coal	Public Service Co of NM	4,751,623
3	Hobbs Generating Station	Natural gas	Lea Power Partners LLC	3,789,631
4	Luna Energy Facility	Natural gas	Public Service Co of NM	3,303,684
5	Cunningham	Natural gas	Southwestern Public Service Co	1,291,298
6	Roosevelt County	Wind	EDF Renewable Asset Holdings, Inc.	1,099,277
7	El Cabo Wind	Wind	Avangrid Renewables LLC	1,077,111
8	Afton Generating Station	Natural gas	Public Service Co of NM	909,329
9	Rio Grande	Natural gas	El Paso Electric Co	884,107
10	Grady Wind Energy Center, LLC	Wind	Pattern Operators LP	833,070

Source: U.S. Energy Information Administration, Form EIA-923, Power Plant Operations Report and predecessor forms.

New Mexico's electric suppliers are a mix of owner-operator cooperatives[33] and private service providers. The private entities typically serve the urban regions of the state while the cooperatives primarily serve rural areas. Electricity providers include three investor-owned electric utilities (PNM, Southwest Public Service, and El Paso Electric), seven municipal utilities[34] and tribal utilities (Pueblo of Acoma Utility Authority, Jicarilla Apache Nation Power Authority, and Navajo Tribal Utility Authority), and sixteen electric cooperatives. The grid which connects electric generation to load (consumers) is shown in Figure 12.

[33] Electric cooperatives are private nonprofits who delivery electricity to its members. The majority of New Mexico based coops receive their power from Tri-State Generation and Transmission Association, a wholesale power provider. Several coops receive their power from Western Farmers Electric Cooperative.

[34] Municipal utilities which provide electricity (and other services) in New Mexico include the City of Aztec, the City of Farmington, the City of Gallup, Los Alamos County Utilities; Raton Public Service Co.; the Town of Springer; and the City of Truth or Consequences. (American Public Power, https://www.publicpower.org/public-power-new-mexico)

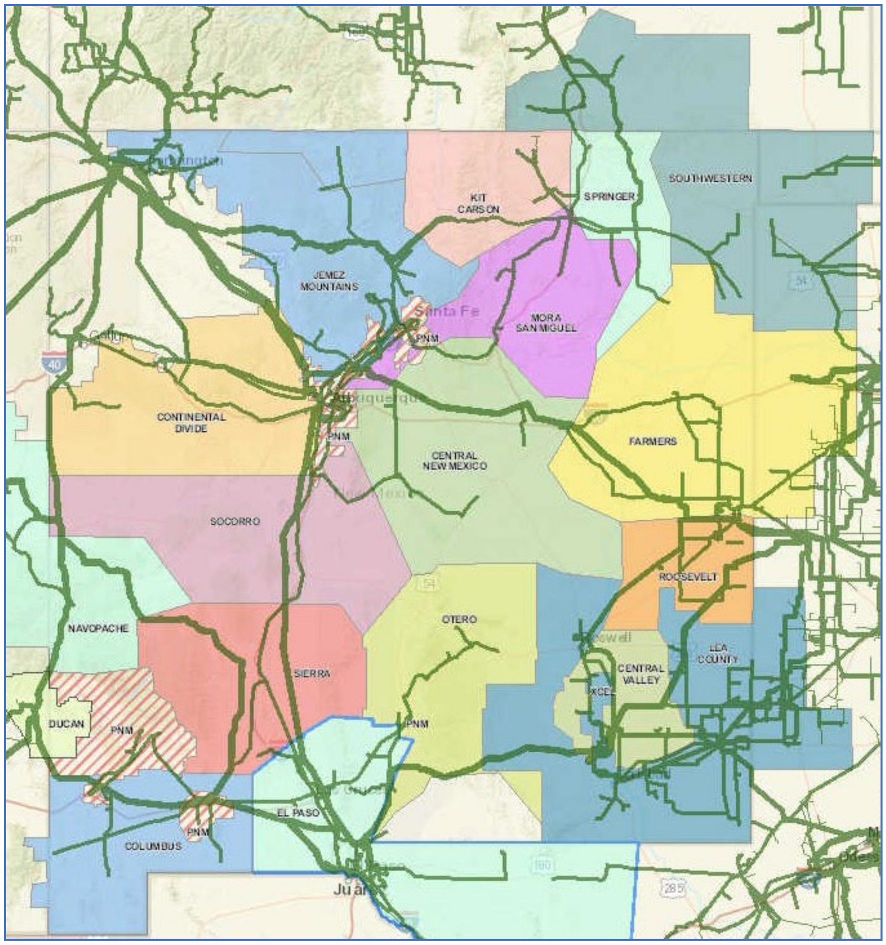

Figure 12: New Mexico Electric Power Supplier Territories and Transmission Lines[35]

Transmission lines and substations are necessary for moving electricity from where it is generated to where it is used. One critical transmission path includes pairs of high voltage (345 kilovolt) transmission lines originating at the San Juan and Four Corners generating stations in the northwest corner of the state.[36] These lines serve the central part of New Mexico. Additional lines run east and south, as shown in Figure 12. Projects are being developed to increase the capacity for moving electric power around and across the state.[37]

Electricity Uses and Load Centers

The state's most populated areas consume the most electricity. Counties with more than 100,000 people include Bernalillo, Dona Ana, Santa Fe, Sandoval, and San Juan Counties; Bernalillo County being the largest at over 600,000 people.[38] New Mexico's major federal facilities[39] represented less than 2% of the state's

[35] Sandia National Laboratories report SAND2020-1033; Information derived from the following resources: Esri, HERE, DeLorne, USGS, Intermap, INCREMENT P, NRCan, ESRI Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, ©OpenStreetMap contributors, and the GIS User Community

[36] The two 345 kilovolt lines between northwestern New Mexico and the Albuquerque metro area have a capacity of 1000 megawatts each. A 345 kilovolt line between the Albuquerque area to the Clovis area has a capacity of 500 megawatts.

[37] For more information about transmission line projects, see https://nmreta.com/transmission-lines/

[38] https://www.newmexico-demographics.com/counties_by_population

[39] These include, in order of largest to smallest electric load: Los Alamos National Laboratory, Sandia National Laboratories, Kirtland Air Force Base, Holloman Air Force Base, White Sands Missile Range, and Cannon Air Force Base.

electric load in 2016,[40] and some of these facilities have the capability to generate power. Growth in electric vehicles may increase electric demand in the future.

Electricity Costs

As of December 2021, in New Mexico, the average retail price for electricity was 13.07 cents/kWh for residential customers, 10.38 cents/kWh for commercial customers and 6.15 cents/kWh for industrial customers. New Mexico ranks 20th nationally in average residential electricity rates.[41]

Electricity Sector Assurance Indicators

Electricity is a highly reliable and versatile form of energy. Reliability and performance requirements prescribed by the North American Electric Reliability Council, the Federal Energy Regulation Commission, the Western States Coordinating Council, and the New Mexico PRC provide oversight and support the electric sector. Three industry-standard metrics for electricity system reliability are the System Average Interruption Index (SAIDI), the System Average Interruption Frequency Index (SAIFI), and the Customer Average Interruption Duration Index (CAIDI). The SAIDI measures the average duration (in minutes) of outages for each customer served and the SAIFI measures the average number of interruptions a customer would experience in a given period, say over a year. The CAIDI (in minutes) is a calculated metric indicating the average time customers who experienced outages were without power for the year. CAIDI is an indicator of restoration time. Table 4 summarizes the average SAIDI, SAIFI, and CAIDI metrics for sixteen New Mexico electricity providers (investor-owned utilities, municipal utilities, and cooperatives) for six recent years. [42]

Table 4: Average Reliability Indices of New Mexico Electricity Providers

	2015	2016	2017	2018	2019	2020
SAIDI (minutes)	122.3	136.3	140.6	138.3	170.2	148.2
SAIFI	1.130	1.452	1.297	1.146	1.213	1.010
CAIDI (minutes)	108.2	93.9	108.4	120.6	140.3	146.7

The affordability of electricity is another important assurance indicator. Shown in Figure 13 are comparative energy insecurity measures as collected by the EIA. Improvements in four areas are noted since 2015. In addition, the New Mexico Human Services Department collects statistics on the number of participants, by county, participating in the Low-Income Energy Assistance Program.[43]

[40] NM EMNRD Energy Roadmap, 2019 Baseline Report.

[41] U.S. Energy Information Administration, 2021

[42] SAIDI, SAIFI, and CAIDI metrics are reported to the NM PRC and the EIA and can include or exclude "Major Event Day" data. The NM PRC reports data for investor owned utilities without major event days. Data in Table 4 (from EIA, 2021) include a total of 16 electricity providers (out of a total of 32) representing 91% of electricty customers. Data in Table 4 include major event days. 2021 data are not yet available.

[43] See https://www.hsd.state.nm.us/lookingforinformation/data-book/

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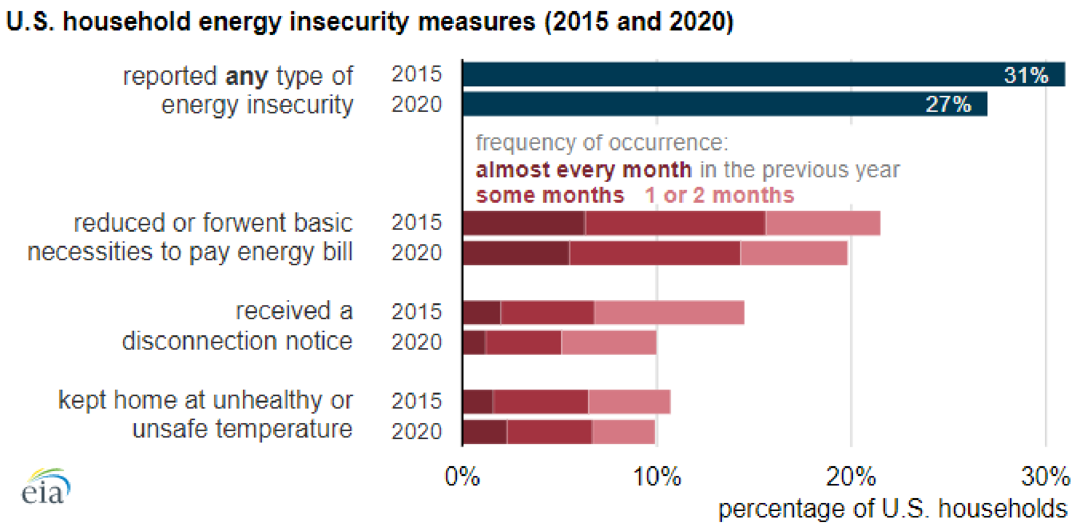
In 2020, 27% of U.S. households had difficulty meeting their energy needs



Source: U.S. Energy Information Administration, *Residential Energy Consumption Survey* (RECS)

In 2020, 34 million U.S. households (27% of all U.S. households) reported difficulty paying energy bills or reported that they had kept their home at an unsafe temperature because of energy cost concerns. This estimate is less than what was reported in the previous iteration of the *Residential Energy Consumption Survey* (RECS), when 37 million households, or 31%, reported similar issues in 2015. The RECS measures household energy insecurity by asking a series of questions about challenges paying energy bills or conditions of unsafe temperatures attributable to energy cost concerns.

Figure 13: U.S. Household Energy Security Measures (EIA)

A.5 NATURAL GAS SECTOR

Sources and Providers

New Mexico natural gas production reached a high point in the year 2020 as shown in Figure 14 and was among the top 10 producers in the nation. Almost 6% of U.S. proved natural gas reserves are in New Mexico with New Mexico accounting for 6% of the nation's total natural gas production. The primary producing counties are Eddy and Lea (southeastern New Mexico), yet Rio Arriba and San Juan Counties (in northwestern New Mexico) also produce significant quantities of natural gas. Natural gas in New Mexico is produced on federal, state, and private land in respective percentages of 70%, 22% and 8%.[44] New Mexico produces more natural gas than it consumes, almost three times as much natural gas leaves the state as enters it. Interstate pipelines bring natural gas into New Mexico from Texas and Colorado and carry most of the natural gas that leaves the state to Arizona or back to Texas. Two underground natural gas storage fields located in southeastern New Mexico (the Grama Ridge Storage and Transportation Facility and the Washington Ranch Facility) have a combined storage capacity of about 89 billion cubic feet of natural gas, or about 1% of the nation's total storage capacity.[45]

[44] N.M. Energy, Minerals and Natural Resources Department, OCD Production Data for Oil and Gas, 2021 data
[45] EIA, New Mexico state Profile Analysis, April 21, 2022

Processing requirements of natural gas from wells is variable based on the area of extraction and impurity levels of the sources. Processing plants are necessary to remove impurities (oil, water, gases, and natural gas liquids) prior to entering distribution pipelines.

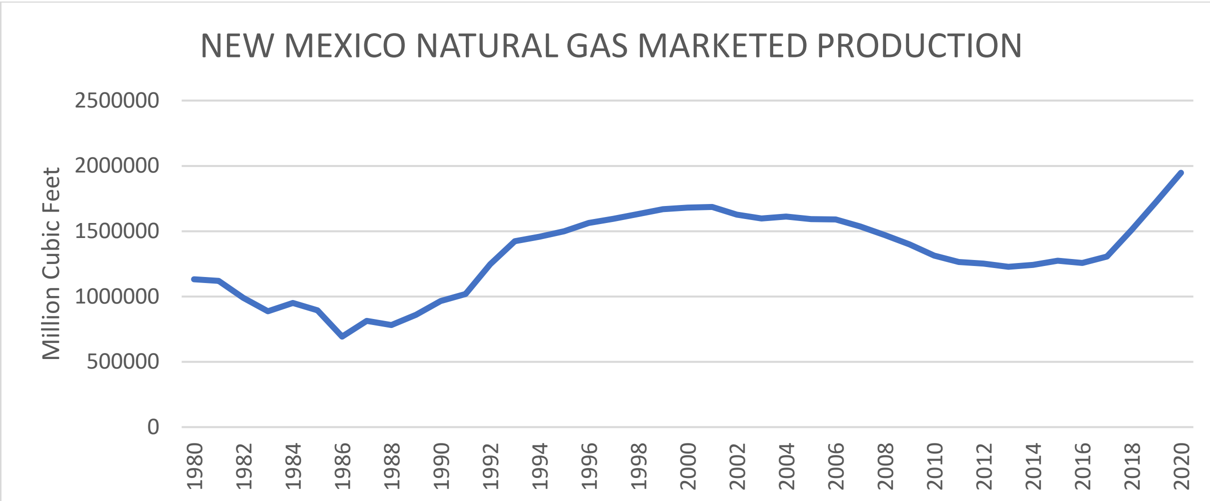


Figure 14: New Mexico Natural Gas Production, 1980-2020 (NM EMNRD, OCD)

Natural Gas Uses

In 2020, New Mexicans consumed one sixth of the natural gas produced by the state that year. The rest, along with substantial volumes from out-of-state sources,[46] was delivered to out-of-state customers. Natural gas pipelines in New Mexico are key to this sector because of the large volume of intra- and interstate transportation of natural gas. In 2021, the state's inventory included 6,409 miles of natural gas transmission pipelines and 21,334 miles of natural gas distribution lines, including mains and service lines.[47]

The electric power sector is New Mexico's largest natural gas user. In 2020, electric power generation accounted for almost 57% of the state's deliveries to natural gas end-use consumers. The state's residential sector, where about three in five households use natural gas as their primary energy source for home heating, accounted for nearly 20% of end-use deliveries. The commercial sector accounted for almost 14%, and the industrial sector used nearly 10%. New Mexicans consumed 284 billion cubic feet of natural gas in 2020.[48] Over two thirds of New Mexico residents heated their homes with natural gas or propane in 2019.

Table 5: Energy Sources for Home Heating (percentage of New Mexico households). EIA 2020

Energy Source Used for Home Heating (share of households)	New Mexico	U.S. Average	Period
Natural Gas	61.8 %	47.8 %	2019
Fuel Oil	0.2 %	4.4 %	2019
Electricity	22.6 %	39.5 %	2019
Propane	6.2 %	4.8 %	2019
Other/None	9.2 %	3.5 %	2019

[46] 780,000 million cubic feet of natural gas were received by NM in 2020 from out of state sources. 1,968,000 million cubic feet were delivered to out of state customers. EIA, 2021

[47] U.S. Department of Transportation, PHMSA data via https://www.phmsa.dot.gov/data-and-statistics/pipeline/pipeline-mileage-and-facilities, accessed May 1, 2022

[48] EIA, 2021

Natural Gas Costs

The price for natural gas for residential users in New Mexico was $7.04 per thousand cubic feet in 2020 whereas the national average price was $10.78.[49]

Natural Gas Assurance Indicators

Though natural gas production is important to New Mexico's energy security, the integrity, safety, and functionality of the intra- and interstate natural gas pipelines are more critical. A listing of New Mexico pipeline operators is included in Appendix 1.

Assurance indicators for natural gas pipelines in New Mexico include the number of excavation damages per 1,000 locator tickets (or requests), inspection days per 1,000 miles of pipeline, number of leaks eliminated or repaired, and inspector qualifications. In 2020 there were 3.5 excavation damages per 1,000 locator tickets.[50] The PRC's Pipeline Safety Bureau oversees pipeline safety and inspects pipelines per state and federal requirements. The DHS's Transportation Security Administration oversees cyber security for natural gas pipeline operations.

A.6 PROPANE SECTOR

Propane Sources, Distribution, and Providers

Propane is primarily a byproduct of natural gas processing, though it can also be produced during the refining of crude oil. After propane leaves the processing plant, it is stored underground as a liquid. Then, it is transported through a network of pipelines, railroad tank cars, and tractor-trailers. From regional storage sites propane is sent to distributors (local suppliers). Finally, propane is pumped into bobtail delivery trucks and delivered to customers.

According to EIA analysis[51], New Mexico is dependent on propane imports from outside the state. The following three paragraphs summarize the analysis:

> Propane produced with refinery streams or at natural gas processing plants in the raw-make (y-grade) needs to be fractionated before it can be marketed. There is only one known fractionator in New Mexico, formerly owned by ConocoPhillips and most recently part of Andeavor/Marathon. The facility was integrated into the Gallup Refinery, which was recently closed, and the status of the fractionator is unknown. The fractionator is estimated to produce about 10,000-15,0000 barrels per day of propane out of its publicly reported 25,000 barrels per day capacity. The site also has a rail yard, which is capable of both receiving and loading hydrocarbon liquids, presumably propane and butanes only.
>
> Based on EIA inventory data (see Figure 16 below), it appears that the propane stored at refineries, wholesale terminals, and gas plants in New Mexico is in mix, because the volumes do not show a seasonal pattern of summer builds and winter draws. It is, therefore, likely that the relatively small quantities of propane reported as being in storage in New Mexico would not be of consumer grade, and therefore not available to the market.
>
> Sources of consumer-grade propane for delivery into New Mexico from other states would include shipments by truck or rail from storage facilities in Adamana, Arizona and the Conway/Hutchinson complex in Kansas, as well as from further away, including the U.S. Gulf

[49] EIA, 2021

[50] https://www.phmsa.dot.gov/data-and-statistics/pipeline/pipeline-mileage-and-facilities, accessed May 1, 2022

[51] Private correspondence between EIA propane team and authors, May 19, 2022

Coast and Canada. Most proximate sources of propane from outside New Mexico are the fractionator in Hobbs, Texas, and refineries in western Texas.

There are over 44 "prime suppliers" of petroleum products (including propane) in New Mexico (as of March 2022).[52] In 2021, New Mexico propane suppliers sold 15,780,000 gallons of propane, a volume that was up 5.4% from the previous year.[53] Figure 15 shows the propane sales history in the state.[54]

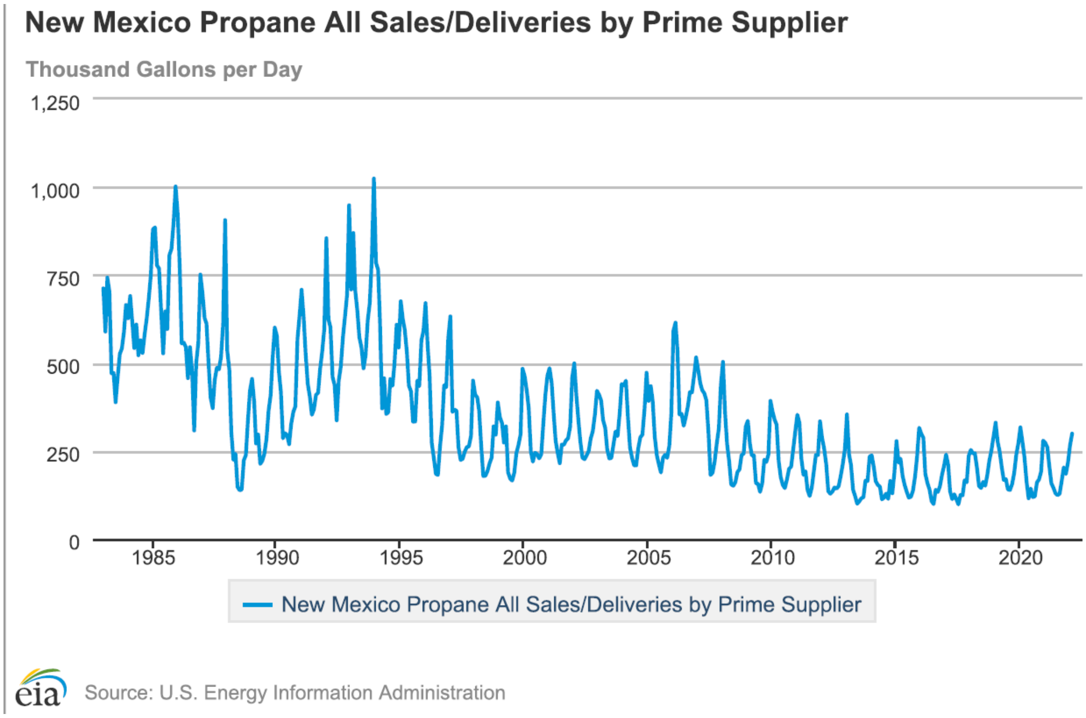


Figure 15: New Mexico Propane Sales (EIA, accessed May 17, 2022)

The principal uses for propane are residential services (heating and cooking) and electricity generation for residential, commercial, and industrial applications. Many rural communities rely heavily on propane. About 6 in 100 New Mexico households use petroleum products, almost entirely propane, for home heating. In 2010, 6.2% of New Mexico residents used propane to heat their homes.[55]

Propane Costs

New Mexico's population spent $121 million on propane in 2020.[56]

Propane Assurance Indicators

The availability of propane in storage is one assurance indicator. Figure 16 shows a downward trend in storage of propane at the state's refineries, bulk terminals, and natural gas plants.[57]

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[52] A prime supplier is defined by the EIA as a firm that produces, imports, or transports selected petroleum products across state boundaries and local marketing areas, and sells the product to local distributors, local retailers, or end users. Additionally, a list of all registered gasoline distributors and special fuel suppliers is available through the New Mexico Department of Taxation and revenue at the following website: https://www.tax.newmexico.gov/all-nm-taxes/2020/10/23/gasoline-tax/

[53] https://www.eia.gov/petroleum/marketing/prime/#tabs-volumes, accessed May 17, 2022

[54] https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=C900030351&f=M, accessed May 17, 2022

[55] EIA, 2021

[56] https://www.eia.gov/state/seds/seds-data-fuel.php?sid=US, and via direct correspondence with EIA staff on May 20, 2022

[57] https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=M_EPLLPA_STR_SNM_MBBL&f=M, accessed 17 May 2022

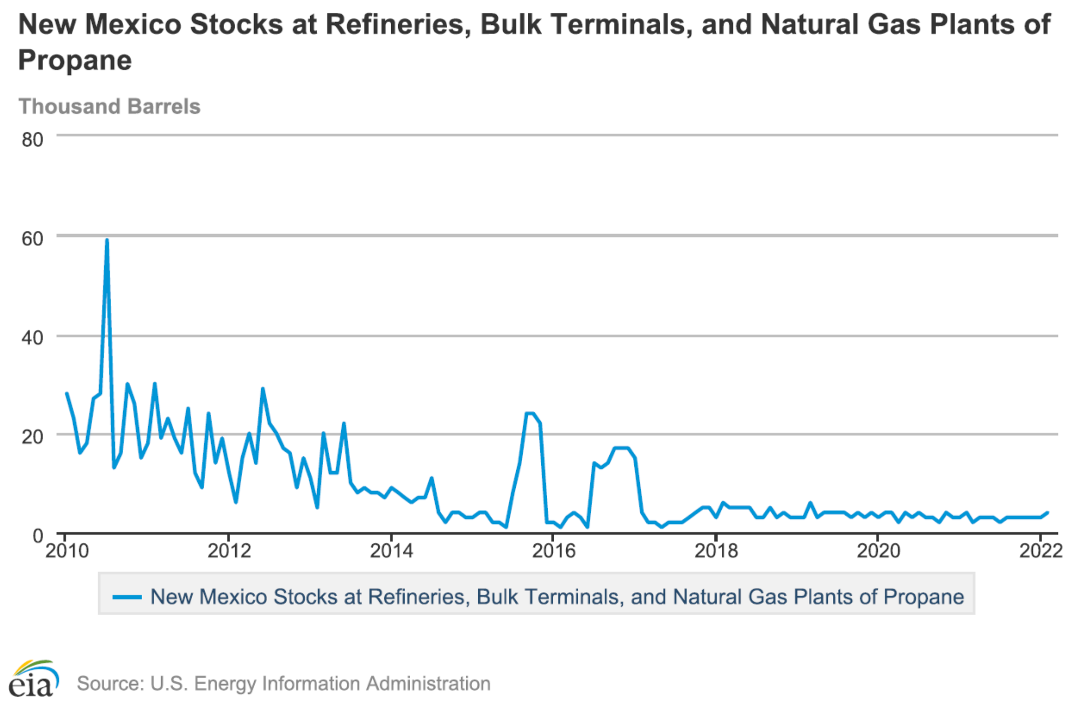

Figure 16: New Mexico Propane Stocks (EIA, accessed May 17, 2022)

A.7 PETROLEUM SECTOR

Petroleum Sources and Providers

New Mexico's crude oil and petroleum infrastructure consists of upstream (production wells), midstream (gathering and processing), and downstream (storage, refining and delivery) assets. The primary production area within the state is the Permian Basin within Lea and Eddy Counties in the far southeastern area of New Mexico.[58] As shown in Figure 9., the southeastern part of the state houses most of the petroleum carrying pipelines as well. New Mexico hosts 2,545 miles (1,897 miles of interstate plus 648 miles of intrastate) of crude oil pipelines.[59]

Production of crude oil increased dramatically in New Mexico between 2015 and 2020 as shown in Figure 17.[60] In 2021, production of petroleum in the state occurred on federal, state, and private lands in respective percentages of 72%, 22% and 6%.[61] In 2021, New Mexico became the nation's second-largest crude oil-producing state, after Texas. New Mexico has about 9% of U.S. total proved crude oil reserves and has the second-largest number of federal leases and the largest number of producing oil and gas wells on federal lands. The state accounted for more than 11% of total U.S. crude oil production in 2021.[62]

[58] N.M. Energy, Minerals and Natural Resources Department, OCD Production Data for Oil and Gas, 2021
[59] https://www.phmsa.dot.gov/data-and-statistics/pipeline/pipeline-mileage-and-facilities, accessed May 1, 2022
[60] N.M. Energy, Minerals and Natural Resources Department, OCD Production Data for Oil and Gas, 2021
[61] N.M. Energy, Minerals and Natural Resources Department, private correspondence, May 2022
[62] EIA, New Mexico state Profile Analysis, April 21, 2022

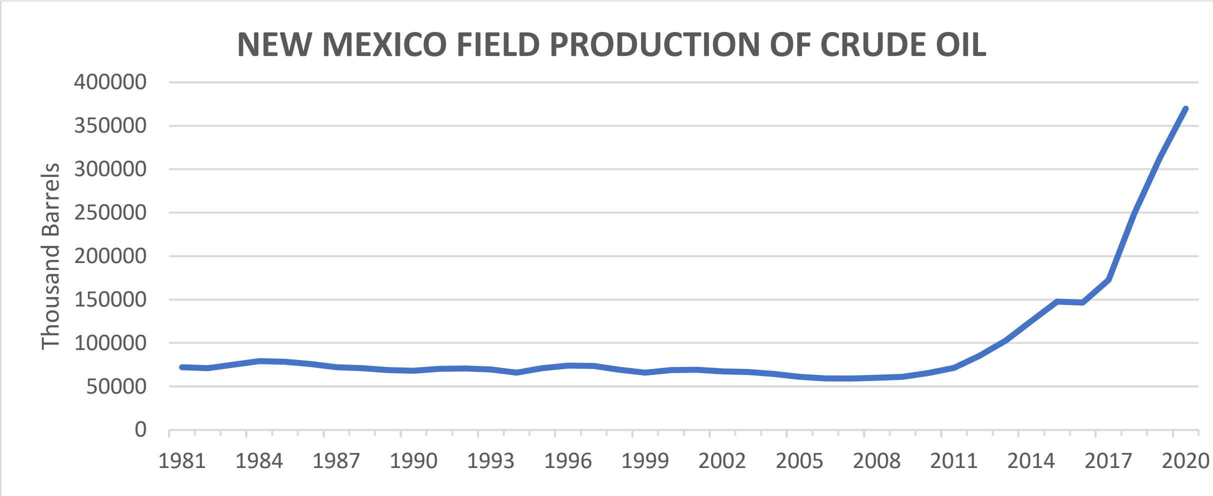

Figure 17: New Mexico Crude Oil Production, 1981-2020 (NM EMNRD, OCD)

Pipelines in New Mexico carry natural gas and crude oil, as well as liquids derived from these resources such as refined petroleum products (i.e., gasoline, diesel fuel, jet fuel, and fuel oil). Liquid carbon dioxide and other liquids such as propane, ethane, butylene, and anhydrous ammonia are also transported in pipelines. In 2020, the state's inventory included 5,738 miles of liquid pipelines.[63]

New Mexico has one operating refinery located in Artesia in southeastern New Mexico operated by HollyFrontier Corporation which can process both heavy sour and light sweet crude oils and has a capacity of 110,000 barrels per day.[64] Most of the crude oil processed in this facility comes from the Permian Basin, but it also processes crude oil transported by pipeline from other areas, including Canada. That refinery serves markets in the southwestern United States and northern Mexico.[65] In the year 2021, this refinery produced kerosene, jet fuel and diesel fuel, but no gasoline.[66] It can be inferred that all of New Mexico's gasoline and much of its other refined petroleum products are imported from other states.

Petroleum Uses

New Mexicans consumed 51 million barrels of petroleum in 2019.[67] As shown in Figure 7, the transportation sector is the leading petroleum consumer in New Mexico and this sector accounts for more than four fifths of all petroleum used in the state. Table 6 summarizes the transportation fueling and recharging stations in New Mexico, along with the date for each statistic.

Table 6: Transportation Fueling/Charging Stations in New Mexico. EIA 2022

TYPE OF FUELING STATION	NUMBER OF STATIONS IN NEW MEXICO	PERIOD
Motor Gasoline	841	2019
Propane	54	2022
Electricity	175	2022
E85	13	2022
Compressed Natural Gas and Other Alternative Fuels	9	2022

[63] https://www.phmsa.dot.gov/data-and-statistics/pipeline/pipeline-mileage-and-facilities, accessed May 1, 2022
[64] https://www.eia.gov/energyexplained/oil-and-petroleum-products/refining-crude-oil-refinery-rankings.php, accessed May 1, 2022. Note that at maximum capacity, the New Mexico refinery would provide approximately 75% of New Mexico's petroleum needs.
[65] EIA 2022, https://www.eia.gov/state/analysis.php?sid=NM
[66] EIA 2022, https://www.eia.gov/dnav/pet/pet_pnp_cap1_dcu_SNM_a.htm
[67] EIA 2022, https://www.eia.gov/state/analysis.php?sid=NM

Petroleum is also used in the industrial sector primarily as a chemical feedstock for plastics, polyurethane, lubricants, solvents, and other products. As shown in Figure 7, approximately 15% of New Mexico's petroleum consumption is in the industrial sector. The residential and commercial sectors each consume about 2%, and the electric power sector uses about 1%.

Petroleum Costs

New Mexico's population spent $5.3 billion on transportation fuel in 2019. Expenditures for motor gasoline totaled $2.4 billion, or roughly $1,146 per person for 2019. New Mexico ranks 32nd nationally in motor gasoline expenditures per person.[68]

Petroleum Assurance Indicators

Assurance indicators for petroleum pipelines in New Mexico include the number of excavation damages per 1,000 locator tickets (or requests), inspection days per 1,000 miles of pipeline, number of leaks eliminated or repaired, and inspector qualifications. In 2020, there were 3.5 excavation damages per 1,000 locator tickets.[69] The PRC's Pipeline Safety Bureau oversees pipeline safety and inspects pipelines per state and federal requirements.

A.8 COAL SECTOR

Coal Sources and Production

Coal production has been steadily declining in New Mexico, see Figure 18. Production in 2020 included operations in San Juan and McKinley Counties at the two surface mines (El Segundo and Navajo Mine) and one underground mine (San Juan Mine 1). Three fourths of New Mexico's coal production occurred on tribal and private lands (43% and 34% respectively), while production on federal and state lands contributed 12% and 10%, respectively, to total coal production.[70] The largest coal reserves are in northwest and northeast New Mexico. Production of methane from coalbeds has been declining in New Mexico since the year 2000[71] and is currently reported as natural gas production.

[68] The national average expenditure per person for motor gasoline in 2019 was $1130 and the N.M. average was $1146. (EIA, 2019, Table E16).
[69] https://www.phmsa.dot.gov/data-and-statistics/pipeline/pipeline-mileage-and-facilities, accessed May 1, 2022
[70] Source: 2020 production data from NM EMNRD Staff Communication, May 16, 2022
[71] https://www.eia.gov/dnav/ng/hist/rngr52snm_1a.htm, accessed April 2022

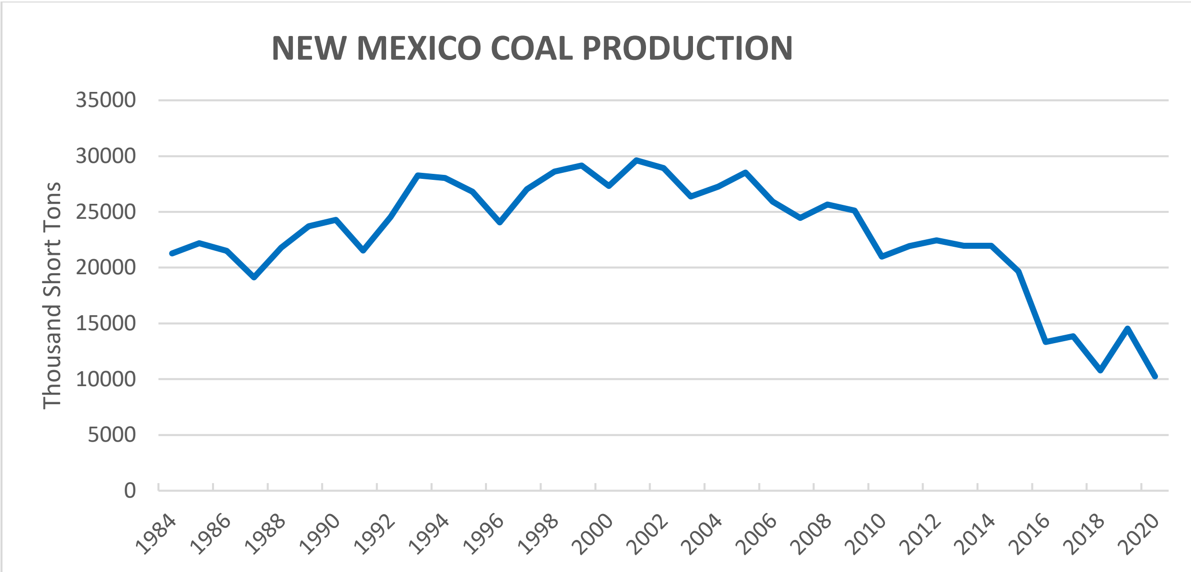

Figure 18: New Mexico Coal Production, 1984-2020 (EIA)

Coal Uses

As shown in Figure 10, coal was the predominant source of energy for New Mexico's electricity generation in 2020. Trains transport nearly 70% of coal deliveries in the U.S. for a portion of the distance from mines to consumers,[72] though colocation of power plants to coal mines in New Mexico minimizes long-haul transportation needs.

Coal Assurance Indicators

Production and cost of coal for electricity generation are assurance indicators. As the state continues to shift its sources of electricity away from coal as called for in the 2019 Energy Transition Act, coal for instate use becomes less important; however, today, coal remains an important resource in New Mexico.

Chapter B. Energy Sectors Risks and Vulnerabilities

B.1 NEW MEXICO ENERGY SECTOR RISK PROFILE

The U.S. Department of Energy's Office of Cybersecurity, Energy Security, and Emergency Response (DOE CESER) prepared a profile of New Mexico's energy sector risks based on 2020 data. This profile (at the "Traffic Light Protocol's white level"[73]) is available on the CESER website and is reproduced in Appendix 5. The CESER profiles include data on the most frequent outages or disruptions to three energy sectors. Weather and/or falling trees were the leading causes of New Mexico's electric outages in the 2008-2017 timeframe. New Mexico's natural gas supply was most impacted by pipeline corrosion and outside forces in the 1984-2019 timeframe. The top events affecting petroleum supply were outside forces when transported by truck, material failures when transported by rail, equipment failures and corrosion when transported by pipelines.

Interviews with a subset of New Mexico energy providers from all sectors revealed several risks or vulnerabilities not mentioned in the CESER profiles. These include:

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[72] EIA, 2022

[73] The Traffic Light Protocol was designed with the objective to create a classification scheme for sharing sensitive information while keeping control over its distribution at the same time. TLP color levels are red, amber, green, and white. White refers to information that can be shared publicly.

- Supply chain problems, particularly materials and equipment (trucks),
- Personnel shortages given the pandemic and retiring workforce,
- The lack of a strategic reserve of materials, equipment, and personnel to respond to major electrical emergencies is of concern, especially for rural energy emergencies.

For more information regarding critical energy infrastructure assets and interdependency issues, see Part III.

Chapter C. Monitoring the State of Health of the Energy Sectors

New Mexico's energy providers currently monitor several state-of-health metrics, primarily:

- Electric reliability indices and outages
- Production capacities of oil, natural gas, and coal
- Pipeline inspections, damage incidents, and leaks repaired

The EIA also tracks costs, emissions, water use, and other metrics at the state level.

During the drafting of this update, metrics related to unsuccessful cyber-attacks, injuries on the job, or other indicators of possible weaknesses or vulnerabilities in the energy sectors were not readily available. See Part III, Section C.2 for observations and recommendations on this topic. A possible resource regarding monitoring the electric sector for cyber threats is CESER's Cybersecurity Risk Information Sharing Program.[74]

Chapter D. Energy Emergency Response Plans

A subset of energy providers were interviewed during the drafting of this update. Below are examples of emergency response and emergency preparedness activities currently being implemented by one or more energy providers:

- Electricity providers develop and exercise emergency response protocols for their operations. Providers are also obligated to report loss of load at certain levels per PRC rule 560 and report reliability indices to NERC. Emergency response exercises are conducted at the local, statewide, and national level. Such exercises are very helpful for identifying communication barriers.
- The New Mexico Association of Emergency Management Professionals offers training for emergency managers.
- Pipeline operators are required to prepare emergency response plans and the PRC's Pipeline Safety Bureau monitors this preparedness action.

Chapter E. Observations

Part II of this SESP presents a picture of the state's overall energy assets. Natural gas, petroleum and coal currently provide most of the state's energy resources and play key roles in transportation and electricity generation. Assuring the operation of the energy transportation assets (transmission lines for electricity and pipelines for petroleum and natural gas) in addition to the production facilities is important to the state's energy security. Many physical and operational assurance monitoring indicators are currently being tracked, yet the same was not found for cyber assurance indicators.

[74] The **Cybersecurity Risk Information Sharing Program (CRISP)** is a public-private partnership, co-funded by DOE and industry and managed by the Electricity Information Sharing and Analysis Center. The purpose of CRISP is to collaborate with energy sector partners to facilitate the timely bi-directional sharing of unclassified and classified threat information and to develop situational awareness tools that enhance the sector's ability to identify, prioritize, and coordinate the protection of critical infrastructure and key resources. CRISP leverages advanced sensors and threat analysis techniques developed by DOE along with DOE's expertise as part of the nation's Intelligence Community to better inform the energy sector of the high-level cyber risks. Current CRISP participants provide power to over 75% of the total number of continental U.S. electricity subsector customers. https://www.energy.gov/sites/default/files/2021-12/CRISP%20Fact%20Sheet_508.pdf

PART III. CRITICAL INFRASTRUCTURE AND INTERDEPENDENCIES

Part III of this SESP is focused on issues that relate to more than one specific energy sector. Chapter A addresses all the energy sectors as an integrated statewide energy "enterprise" and presents issues that rise to the category of "critical energy infrastructure" because of their overall importance to New Mexico's energy security. Chapter B addresses interdependencies among individual energy sectors and interdependencies between the energy enterprise and other important infrastructures. Chapter C presents concluding observations from Part III.

Chapter A. Critical Infrastructure and Critical Energy Infrastructure

A.1 DEFINITIONS

There are 16 critical infrastructure categories,[75] including energy, whose assets, systems, and networks, whether physical or virtual, are considered so vital to the United States that their incapacitation or destruction would have a debilitating effect on security, national economic security, national public health or safety, or any combination thereof. Presidential Policy Directive 21 (PPD-21): Critical Infrastructure Security and Resilience advances a national policy to strengthen and maintain secure, functioning, and resilient critical infrastructure.[76] The same definition can be applied to state assets, systems and networks that are considered vital to New Mexico.

CRITICAL INFRASTRUCTURE CATEGORIES (per the U.S. DHS's Cybersecurity and Infrastructure Security Agency)

Chemical
Commercial Facilities
Critical Manufacturing
Dams
Defense Industrial Base
Emergency Services
Energy
Financial Services
Food and Agriculture Services
Government Facilities
Healthcare and Public Health
Information Technology
Nuclear Reactors, Materials and Waste
Transportation Systems
Water and Wastewater Systems

While all energy infrastructure is important, ***critical energy infrastructure can be defined as physical or virtual energy systems and assets so vital that the incapacity or destruction of such systems and assets would have a debilitating impact on national security, economic security, public health or safety, or any combination of those matters***. Critical energy infrastructure consists of energy generation/production, transmission, and distribution systems that power hospitals, wastewater treatment plants, communications towers, food distribution facilities, residential communities, and defense installations, and are key targets of foreign cyber adversaries. Successful cyber-attacks from our nation's foreign adversaries against energy systems could undermine the continuity of business and government operations, destabilize local economies, and even jeopardize public health. Energy is also the backbone of all other critical infrastructure systems, meaning that an energy supply failure could have cascading effects on transportation, water, telecommunications, finance, healthcare, and other sectors.[77]

This section describes general descriptions of possible critical energy infrastructure elements.

A.2 NEW MEXICO'S CRITICAL ENERGY INFRASTRUCTURE

Based on an assessment of the information available, the following energy assets are likely of greatest importance to the overall security of the New Mexico energy enterprise:

[75] Note that DHS's Cybersecurity and Infrastructure Security Agency (CISA) uses the term "sector" for the suite of energy infrastructure assets and enterprises, while in this document, "sector" refers to a specific type of energy system (i.e., electric sector, coal sector, etc.) and "energy enterprise" refers to the collection of specific energy sectors in the state as a whole.
[76] https://www.cisa.gov/critical-infrastructure-sectors (CISA)
[77] Amritt C, Lauf D, Woods M. (2022 February). An Issue Brief on the States' Role in Addressing Foreign Threats in U.S. Critical Energy Infrastructure Sectors. Washington, DC: National Governors Association Center for Best Practices.

- For the electrical sector: electrical generation plants, transmission and distribution lines, transformers and substations, grid monitoring and control systems.
- For the petroleum, propane and natural gas sector: oil and gas wells, oil refineries, pipelines and compressor/reducing stations, storage facilities, and transportation assets.

The New Mexico Statewide Infrastructure Threat Assessment report[78] identifies the following infrastructure groups as a part of the assessment:

- Technology Group (Electricity, Information Technology, and Communications)
- Civic Services Group (Government Infrastructure, Emergency Services, Healthcare and Public Health, and Transportation Systems)
- Water and Food Group (Water and Wastewater Systems, Food and Agriculture, and Dams)
- Economic Group (Commercial Facilities, Financial Services, and Critical Manufacturing)
- Production Group (Oil and Natural Gas Subsector and Chemical)
- National Security Group (Defense Industrial Base and Nuclear Reactors, Materials, and Waste)

Note that the energy sectors cross cuts several infrastructure groups.

The report notes that the Technology Group (electricity and communications) is identified as having the greatest potential consequence from an attack due to inherent interdependencies with other critical infrastructure groups and the Production Group (oil and natural gas) is identified as one of the most vulnerable groups for terrorist, extremist, and criminal attacks.

According to the analysis in the New Mexico Statewide Infrastructure Threat Assessment report, the electrical sector's greatest vulnerability resides with cyber-attacks through the internet on the industrial control systems which monitor and automatically control system parameters and operation. The oil and natural gas sector's greatest vulnerability lies in the many miles of pipelines and remote compressor and pump stations. These could become targets for terrorists, domestic extremists, and criminals.

A general description of critical infrastructure issues faced by the electricity sector, natural gas and propane sectors, and petroleum sectors are summarized below.

Electricity Sector

The electricity sector is comprised of three segments: generation facilities, transmission facilities, and distribution assets. Electric service providers (also referred to as electric utilities) may own and operate all or part of the electricity delivery infrastructure. Each segment and electric utility will most likely have a listing of critical energy infrastructure assets to maintain secure and reliable delivery of electricity.

Identification of critical generation assets is an important preparedness action. The loss of any large generation unit could cause undervoltage or underfrequency conditions which will negatively impact electric grid stability and cause cascading system failures. Utility emergency response plans normally include actions to take during a hypothetical loss of a certain amount of base power generation to maintain grid stability.

There are many actions and failures that can cause loss of a generating facility. Operating systems within generation facilities are considered critical systems if their failure would cause the shutdown of a generation unit. Within these critical systems, components that can cause failure of a critical system are categorized as critical components. Critical systems and components must be analyzed for risk of failure and consequence of failure to develop proper failure prevention and mitigation measures. Fuel used for electric generation is also considered in a vulnerability analysis as these sources are variable in reliability.

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[78] 2021 Statewide Critical Infrastructure Threat Assessment, NM-IB-0211-21-201, dated February 11, 2021

Transmission (above 39 kilovolts) and distribution assets (substations and transformers) which convert power from one voltage to another are critical elements of the electrical system. These devices currently have long lead times for delivery due to supply chain issues and are expensive to keep as spares. Not all transmission and distribution systems have the same design parameters so equipment may require customized manufacturing. Remote access control systems and switches can also be subject to failure and vulnerable to cyber-attack unless they are built and operated under strong information security protocols.

New Mexico's electricity providers include three investor-owned electric utilities, seven municipal utilities and tribal utilities, and sixteen electric cooperatives. This distribution of providers reduces the vulnerability of total system failure from cyber-attack or single failure mechanisms. However, the highly distributed nature of the electrical system requires integration and coordination at many levels (local, state, regional and national). Each provider is also vulnerable to cyber-attack due to the dependency on information technology for billing, metering, system control and monitoring functions, which are ubiquitous on the electricity delivery system. The risk and impacts of disruptions are variable due to system designs and how the service is constructed and organized.

Preparedness actions currently being implemented by the electricity sector limits system outage impacts to customers. Requirements set by federal (Federal Energy Regulation Commission and North American Electric Reliability Council), regional (Western States Coordinating Council), balancing authorities, and state (PRC) entities provide a strong foundation for emergency response planning, outage reporting, and reliability reporting of individual electricity providers. Individual electric service providers may perform vulnerability and risk analyses on their systems; however, an assessment or analysis of the integrated set of electricity sector providers and assets would be valuable to better understand the overall system reliability.

In summary, large generation facilities and associated transmission and distribution systems could be considered critical energy infrastructure assets along with protection of control systems from cyber-attack. (See Table 3 in Part II for a listing of the largest generation facilities in the state.) As described in Part II, Section A.4, a critical transmission path includes pairs of high voltage (345 kilovolt) transmission lines originating at the San Juan and Four Corners generating stations in the northwest corner of the state.

Natural Gas and Propane Sectors

The natural gas and propane energy sectors are comprised of three segments: production and processing, transmission and storage, and distribution. Each of these segments contain critical energy infrastructure components.

Natural gas production wells are numerous and wide-spread, largely through the San Juan Basin and Permian Basin, and are therefore less vulnerable to any single failure and isolated threat; however, most use electricity to provide power to safety and process equipment and many do not have backup power capabilities. This can lead to a loss of natural gas during widespread power outages. (See Part III, Section B.1 for more details related to this fuel-electricity interdependency.) Natural gas processing plants are similar in nature to electrical generation plants from a control system perspective. These facilities should be reviewed from a risk perspective even though loss of one plant would not have a significant impact on natural gas or propane deliveries. Further investigation is warranted on cyber-attack vulnerabilities.

The primary risk to natural gas and propane production is the freezing of water-bearing sensor lines during significant cold weather events. This can impact safety sensor instrumentation lines and result in automatic shutoff of critical systems and isolation of individual wells. If a significant number of production wells experience this phenomenon, pipeline pressure may drop below allowable levels resulting in the shutoff of downstream distribution lines for safety reasons. Lessons learned through actions taken by providers during past winter freeze events (see Appendix 6 for details on events) was the installation of freeze protection on instrument sensing lines. The installation of backup electrical power is another action being taken by this energy sector.

Compressor stations and pipelines are critical infrastructure components of the natural gas transmission and storage segment. Most compressor stations are designed with redundancy of compressor units to support maintenance and repair and to reduce system single failures. In addition, pipeline networks include multiple pathways for delivery and parallel pipelines for increased capacity. The ability to increase line pressure (line pack) also enables mitigation of short-term supply disruptions. Storage capability and capacity of natural gas is relatively robust with the ability to compress the gas in above ground tanks for more capacity and the ability to store reserve supplies in underground depleted oil and gas reservoirs.

The widespread nature of the distribution segment of the natural gas sector prevents significant impacts from single failures and vulnerability from physical threats; however, threats to above-ground pressure reducing stations and control systems from domestic terrorism and cyber-attacks may be one of the biggest vulnerabilities to this segment along with pipeline age and corrosion-related failures.

The critical assets of the propane sector are similar to those of the natural gas sector in the production segment. However, distribution of propane from regional storage facilities to consumers is primarily through trucking and rail. Propane is distributed to consumers by local independent companies who provide both the storage tank and refilling service. In the state of New Mexico, by regulation, only the service provider who provided the storage tank can refill the tank except in a declared emergency.

In summary, there is little risk to the natural gas energy sector and infrastructure that would result in a single point of disruption and an uncontrollable, cascading outage. Propane deliveries to customers, however, may be vulnerable to shortages of delivery trucks and qualified drivers. An integrated review of the state's supply and delivery systems would be warranted to better understand risks and vulnerabilities to these energy sectors, especially in today's constantly changing environment of supply chain issues and cyber threats. Based on lessons learned from previous events (see Appendix 6), the demand for natural gas and propane can exceed supply during severe winter storms. Partial loss of supply combined with an over-demand for product can lead to significant price escalation. Purchasing agreements should be established with suppliers to specify minimum quantities of gas at specific price points in emergency situations. In addition, increasing reserve supplies of natural gas in underground reservoirs in the event of a disruption would be a mitigation strategy.

Petroleum Sector

The petroleum sector is comprised of upstream (exploration and production), midstream (processing and wholesale distribution), and downstream (retail distribution) segments.

The petroleum sector's upstream infrastructure is concentrated in the Permian Basin in southeastern New Mexico with a small portion from the San Juan Basin in northeastern New Mexico, as discussed in Part II, Section A.7. Oil well drilling and extraction production is distributed across many individual well sites, so it is not necessarily impacted by single failures. Supply chain issues and regulatory constraints relating to federal permits and leasing can impact this entire segment.

Critical infrastructure assets within the midstream segment of the petroleum sector include refineries and the transportation facilities, principally pipelines and roadways/railways. There is only one remaining oil refinery in operation in New Mexico, located in Artesia operated by HollyFrontier Corporation, and this refinery does not produce gasoline, but does produce diesel fuel. Supplies of processed petroleum-based products (i.e., gasoline, diesel fuel and aviation fuel) are dependent upon imports from other states. Three major pipelines transport oil product within the state with only one of these pipelines originating within state boundaries. These pipelines have vulnerabilities similar to those of natural gas pipelines with pump stations being vulnerable to threats of wildfire, domestic terrorism and cyber-attack on control systems and lines subject to age-related failures. Robustness of the pipeline system is a vulnerability that is also called out by the DOE CESER risk profile (see Appendix 5). Age and corrosion are two specific issues of concern. Pipeline distribution can be augmented by trucking and railways for product delivery, but at a significantly reduced capacity.

The state has hundreds of retail stations with storage capacity to provide refined petroleum products to customers as the backbone of the retail distribution system. Limitations of this system include the capacity of retail storage, the delivery of refined product in times of increased demand, and regulatory limitations such as environmental permits for underground storage tanks. Interdependencies with the electrical infrastructure are important and discussed in more detail in Section B.1.

Price fluctuations are common in the petroleum sector, and these may be exacerbated during disruptions or emergency situations. Since supplies could be limited or curtailed in emergency situations, purchase agreements with midstream suppliers are critical to ensure supplies to critical users during shortages. Price agreements that cap prices during an emergency are an option for this sector.

In summary, critical energy infrastructure assets of the petroleum sector include the oil refinery located in southeastern New Mexico and distribution pipelines. These pipelines serve a critical delivery function and are potentially vulnerable due to their age. An additional risk for this energy sector is price volatility.

A.3 STATE ENTITIES' ROLES IN ADDRESSING CRITICAL ENERGY INFRASTRUCTURE THREATS

Numerous federal acts and Presidential Policy Directives, see Appendix 7, address the nation's efforts to protect critical infrastructure from threats, including cybersecurity, and establishes federal agency authorities and roles in these efforts.

Protecting the nation's critical energy infrastructure requires robust partnerships between federal interagency partners and state, local, territory and tribal authorities and the energy sector. Private and public sector partnerships with state agencies require a commitment of time, resources, and trust to ensure effective and efficient information sharing and integrated actions to improve the security of energy supplies for the state and its citizens. Close coordination within state agencies is also key to protecting the state's critical energy infrastructure.

Part I of this report addresses state agency roles during the disruption monitoring and response phases of energy emergencies, including interfacing with federal agencies to protect and restore energy infrastructure functions, including those deemed as "critical." State agencies involved are primarily DHSEM, EMNRD, and the PRC. Roles are primarily aligned with specific energy sectors.[79] For New Mexico, there is not an executive or legislative document delegating the responsibility for assessing overall energy enterprise level threats, vulnerabilities, risks, or mitigation strategies although this duty is aligned with the EEAC Team responsibilities. The same observation applies to the responsibilities for these same activities related to infrastructure interdependencies. These functions could be the responsibility of the EEAC Team, which includes representatives from PRC, EMNRD, and DHSEM.

[79] For example, NM EMNRD's OCD for oil and gas production, NM PRC's PSB for pipelines, NM PRC for electricity, etc.

A.4 RESOURCES TO SUPPORT STATEWIDE CRITICAL ENERGY INFRASTRUCTURE PROTECTION ACTIVITIES

The following excerpts from the National Governors Association report entitled "*States' Role in Addressing Foreign Threats in U.S. Critical Energy Infrastructure Sectors*"[80] may be useful resources in preparing for and responding to emergency situations.

Several resources exist to help states analyze and protect critical infrastructure assets. One resource to assist with analysis of critical infrastructure resilience and planning for an emergency is the Infrastructure Security Division DHS's CISA, which operates the Protective Security Advisor Program. According to CISA,

> Protective security advisors are trained critical infrastructure protection and vulnerability mitigation subject matter experts who are available to advise state and local officials as well as critical infrastructure owners and operators. These entities conduct security and resilience surveys and assessments through a range of methods and tools, including assist visits,[81] Infrastructure Survey Tool,[82] Rapid Survey Tool, and the Regional Resiliency Assessment Program.[83]

The National Governors Association Center for Best Practices' State Resilience Assessment and Planning Tool (SRAP Tool)[84] was also created to help Governors and their staff assess state resilience, identify gaps, and plan for natural and man-made disasters. The SRAP Tool is a self-assessment questionnaire designed to help states begin to understand their resilience. It is designed to start conversations around resilience, mitigating the impacts of disasters, and response to disasters. The questionnaire is divided into five topic areas:

1. establishing effective governance,
2. evaluating risk,
3. assessing critical infrastructure vulnerabilities,
4. mitigating economic consequences, and
5. strengthening community ties.

The National Governors Association report included several policy recommendations for Governors to strengthen information sharing frameworks with industry and federal partners. The following are venues for information exchange that can be leveraged:

> State fusion centers serve as focal points for the receipt, analysis, gathering and sharing of threat-related information, specifically man-made and cyber. The fusion centers allow for two-way intelligence and information flow between the federal government and state, local, tribal, and territorial, and private sector partners.
>
> Information Sharing and Analysis Centers (ISACs) serve as coordinating bodies that facilitate information flow across private sector entities and with the government. The threat information synthesized and disseminated by ISACs helps infrastructure owners and operators – along with government partners – effectively protect against physical and cyber security threats.
>
> State officials with a need to know may be able to sign up for alerts through several information centers to maintain situational awareness. Governors can identify who has access to the state information center, as well as who has access to the multi-state

[80] Amritt C, Lauf D, Woods M. (2022 February). An Issue Brief on the States' Role in Addressing Foreign Threats in U.S. Critical Energy Infrastructure Sectors. Washington, DC: National Governors Association Center for Best Practices.

[81] https://www.cisa.gov/assist-visits

[82] https://www.cisa.gov/infrastructure-survey-tool

[83] https://www.cisa.gov/regional-resiliency-assessment-program

[84] https://www.nga.org/center/publications/state-resilience-assessment-planning-tool/

information sharing and analysis centers, as those individuals can be conduits for information dissemination within the state. Energy sector threat information is disseminated through three distinct, sub-sector specific information centers:

- the Electricity Information and Sharing and Analysis Center,[85]
- the Downstream Natural Gas Information Sharing and Analysis Center,[86] and
- the Oil and Natural Gas Information Sharing and Analysis Center.[87]

Chapter B. Critical Energy Infrastructure Interdependencies

B.1 FUEL - ELECTRICITY INTERDEPENDENCIES

One of the most prominent interdependencies among the energy sectors is the fuel-electricity interdependency. Electrical generation is dependent upon fuel sources while the production and processing of fuel requires electricity. In the near term, natural gas will continue to provide firm dispatchable power as New Mexico transitions to variable renewable resources and ramps up energy storage capabilities.

Examples of cascading failures related to this interdependency are the winter freeze events of 2011 and 2021. (See Appendix 6 for more information.) Prolonged extreme cold weather caused the loss of natural gas supply which also resulted in the reduction in capacity or shut-down of some natural gas-fired electrical generation plants. The resulting instability of the electrical grid, due to excessive demand and insufficient supply, led to load shedding of sections of the grid. These electricity shortfalls further affected natural gas production thus creating a cascading failure of both energy sectors.

Situations that further illustrate the fuel-electricity interdependency are listed below:

- Natural gas, propane and petroleum processing and transportation systems may not have sufficient backup electrical power systems to maintain production during prolonged outages. Compressor stations, pumps, and safety monitoring equipment are examples of equipment that needs electricity to operate.
- Most backup electrical power systems require fuel (propane, diesel fuel, gasoline, natural gas).
- Vehicles that run on gasoline and diesel fuel are essential to the transportation of material and personnel to operate the electric system.
- Coal, which, though declining in use, provides a third of electricity currently, is highly dependent on petroleum-based fuels for its extraction and transportation. Rail transport is particularly important.
- Wind and solar (photovoltaic) plants provide power when there is sufficient wind or insolation, yet require electrical power for system control, monitoring, and communications. They also need electricity to restart after shutdown.
- Control systems, critical to all energy system production and operation, require a constant source of power to maintain operations along with internet or wireless communications.

B.2 ENERGY - WATER INTERDEPENDENCIES

The energy – water interdependency is important to New Mexico's energy security, especially given the scarcity of fresh water in the region. Water is required primarily for electrical generation as well as for mining

[85] https://www.eisac.com/
[86] https://www.dngisac.com/
[87] https://ongisac.org/

and fuel processing. Electrical generation facilities that use heat (thermoelectric generation) rely on water for steam and for cooling. Mining operations use water for cooling and for dust control. Oil, natural gas, and propane processing facilities use water as a cooling mechanism in some processes. A lack of water in any of these energy sectors could have significant negative effect on operations.

In 2015, the combination of mining (of all types, including petroleum, natural gas, coal, and any other mineral substances naturally occurring in the earth's crust) and power generation withdrew three of New Mexico's overall water withdrawals from both surface and groundwater sources. Mining accounted for 42,294 acre-feet (AF), mostly from groundwater sources, and power generation accounted for 50,419 AF (mostly from surface water sources) of withdrawals in 2015 as shown in Figure 19.[88] Though the quantity of water used in the generation of electricity is small, it is an essential resource for cooling and boiler operations.

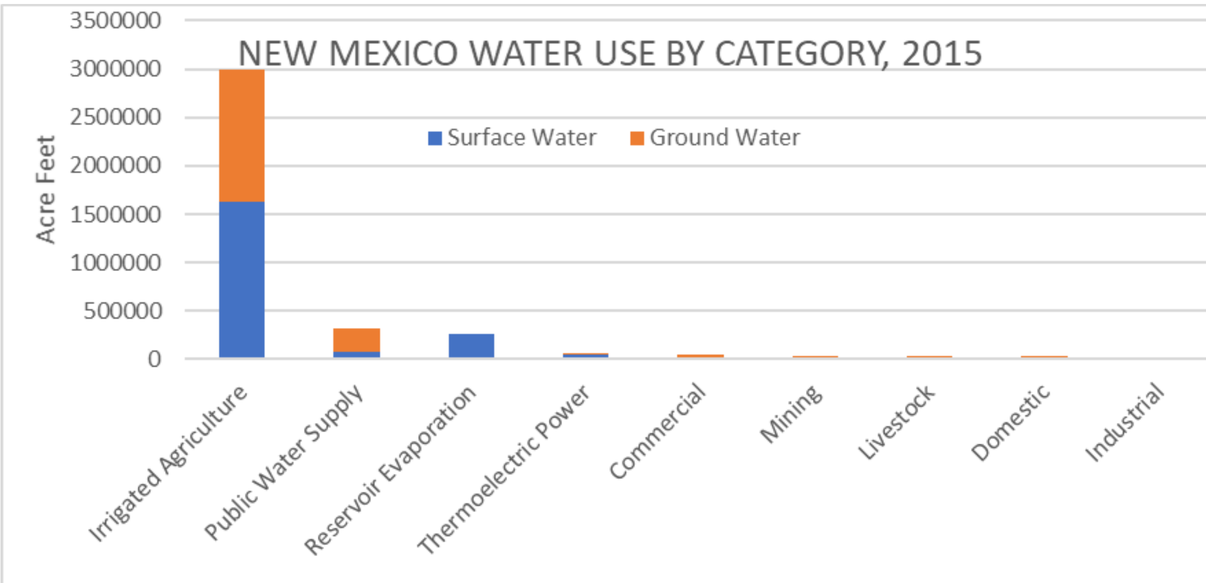

Figure 19: New Mexico Water Use by Category, 2015. New Mexico Office of the State Engineer

Withdrawals in the power category decreased approximately 8% between 2005 and 2010 and decreased again 14% between 2010 and 2015. Of these withdrawals, 39,677 AF (78.7%) were from surface water and 10,742 AF (21.3%) were from groundwater sources. The water intensity of total U.S power generation—the average amount of water withdrawn per unit of total net electricity generated has been steadily decreasing since 2014.

Note that all references to water use refer to it being withdrawn from a surface or groundwater source. Much of the water withdrawn returns to the environment and is thus not truly consumed. Brine water pumped from a depth of 4,000 to 5,000 feet during any mining operation, which is returned by injection into deep brine aquifers, is not included in the state inventory since its impact on the net supply of fresh water is zero. However, water pumped from freshwater aquifers for the secondary recovery of oil, which is later disposed of by injection into deep brine aquifers or spread on the land surface where it evaporates, is treated as a withdrawal.

[88] New Mexico Water Use by Categories 2015 (Technical Report 55, published in 2019 by the NM Office of the State Engineer). Note that these data are published every 5 years. The 2020 data were not available at the time of this document.

Historically, the biggest water concerns about the extractive industries are not the amount of water used but rather the potential for groundwater contamination. Consequently, these industries are highly regulated and monitored by state agencies.

Water separated from petroleum during processing (produced water) is usually either discharged into lagoons where it is evaporated or injected into deep aquifers. The oil and gas industry in New Mexico generated almost 1.3 billion barrels of produced water in 2019, equivalent to over 166,000 AF, as a byproduct of oil and gas production. Of this, over 953 million barrels were reinjected either for disposal or as part of pressure maintenance and/or enhanced oil recovery operations. The reduction of and reuse of produced water is an active area of technical and regulatory action in New Mexico.[89]

Chapter C. Concluding Observations

C.1 RISK AND VULNERABILITY CONSIDERATIONS

Several metrics can be used when vulnerability and threat assessments are being conducted. The most common metric is security, but for New Mexico, several other metrics may be relevant. These include safety, reliability, recoverability, sustainability, and affordability. Figure 20 is an example of an energy system assessed against five functionality areas. Definitions of key terms follow.

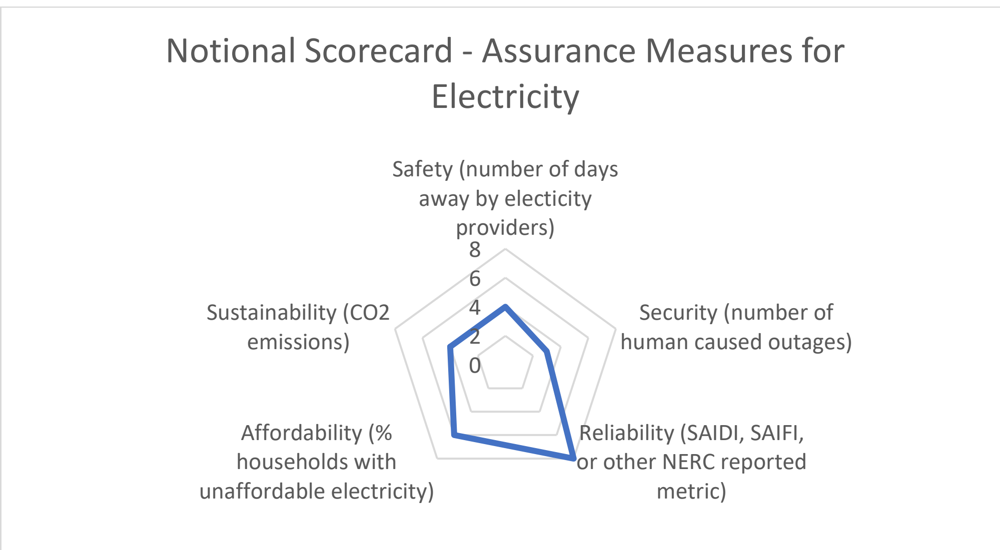

Figure 20: Notional Assurance Scorecard

<u>Definitions</u>:

Vulnerability – a weakness (known or unknown) in a system, process, or other entity that could lead to its functionality being compromised by a threat. The functionality of the state's energy enterprise can be assessed against one or more metrics, with the most common categories being safety, security, reliability, sustainability, and affordability.

Threat – an action (event, occurrence, circumstance) that could disrupt, harm, destroy, or otherwise adversely affect a system.

[89] NM Water Resources Research Institute, Technical Completion Report No. 395, August 2021

Risk – risk constitutes a specific vulnerability matched to a specific threat. Two important aspects of risk are likelihood of disruption and impact of disruption. Entities can accept a given level of risk or attempt to reduce risk by acting; the set of actions proposed constitutes a mitigation plan.

Mitigation Plan – set of actions taken to reduce any unacceptable risks.

An assurance strategy involves blending risk analysis and engineering to assure performance in intended environments; reduce or eliminate the possibility of failure under foreseeable circumstances; and manage the consequences of unintended events.

C.2 OBSERVATIONS

The New Mexico energy sectors are relatively robust and resistant to single failure and most high potential man-made events, excluding cyber. Significant interdependencies exist between fuel, electricity and water that leave the energy sector vulnerable to cascading events. The state has not sustained a significant cascading failure between the energy sectors even when impacted by severe weather events. Although, the 2011 Freeze Event, as discussed in Appendix 6, did result in compensatory actions to prevent both a failure in the natural gas sector and electric sector. Weather related threats pose one of the greatest potential impacts to the energy sectors based on historical events. Numerous lessons learned actions were promulgated from these events to mitigate future impacts (see Appendix 6).

Age related deterioration and wildfires pose the greatest dangers to critical energy infrastructure based on their high potential and degree of impact. Cyber threats to all energy sectors are an area of concern as this threat continues to be prolific and sophisticated. Supply chain impacts have also become more pervasive in the past two years which can lead to lack of equipment and materials for restoration along with shortages of skilled labor. Agreements could be beneficial with natural gas and petroleum providers for establishing contracted supply quantities and maximum pricing during a disruption of supplies.

A more detailed analysis of the threats, vulnerabilities, risks, and mitigation actions for each energy sector as well as the collection of energy sectors (the energy enterprise) would be beneficial in assuring/securing New Mexico's energy assets and functions. Such analyses could inform actions that could be taken to prevent potential failures to the state's critical infrastructure. Interdependencies between the energy sectors and the potential for cascading failures are significant.

For New Mexico, there is not an executive or legislative document delegating the responsibility for assessing overall energy enterprise level threats, vulnerabilities, risks, or mitigation strategies to an agency. One approach to reviewing and improving the state's energy security posture would be for a specific state agency to be delegated as the lead in performing these analyses and developing recommended actions for mitigation of any identified vulnerabilities. Collaborating with the relevant state agencies and private energy enterprise to implement any necessary action steps would position New Mexico as a leader in energy security. To improve energy security and resilience a partnership between state entities and private energy sector companies is essential to identify and prioritize assets for operational priorities and security improvements.

The EEAC Team is well positioned to lead further analysis of the energy sectors and coordinate an exercise to test elements of this plan.