



Scaling Expertise in NEPA Environmental Reviews for Clean Energy Projects

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Outline

- Background
- PolicyAI Overview
- Applications
 - NEPA Document Search
 - NEPA Fact Finding and Topic Summarization
 - NEPA Public Comments Analyzer
- AI Best Practices
- AI Risk Management Strategies
- Discussion

AI and LLM

Perspective: Human-Like Reasoning

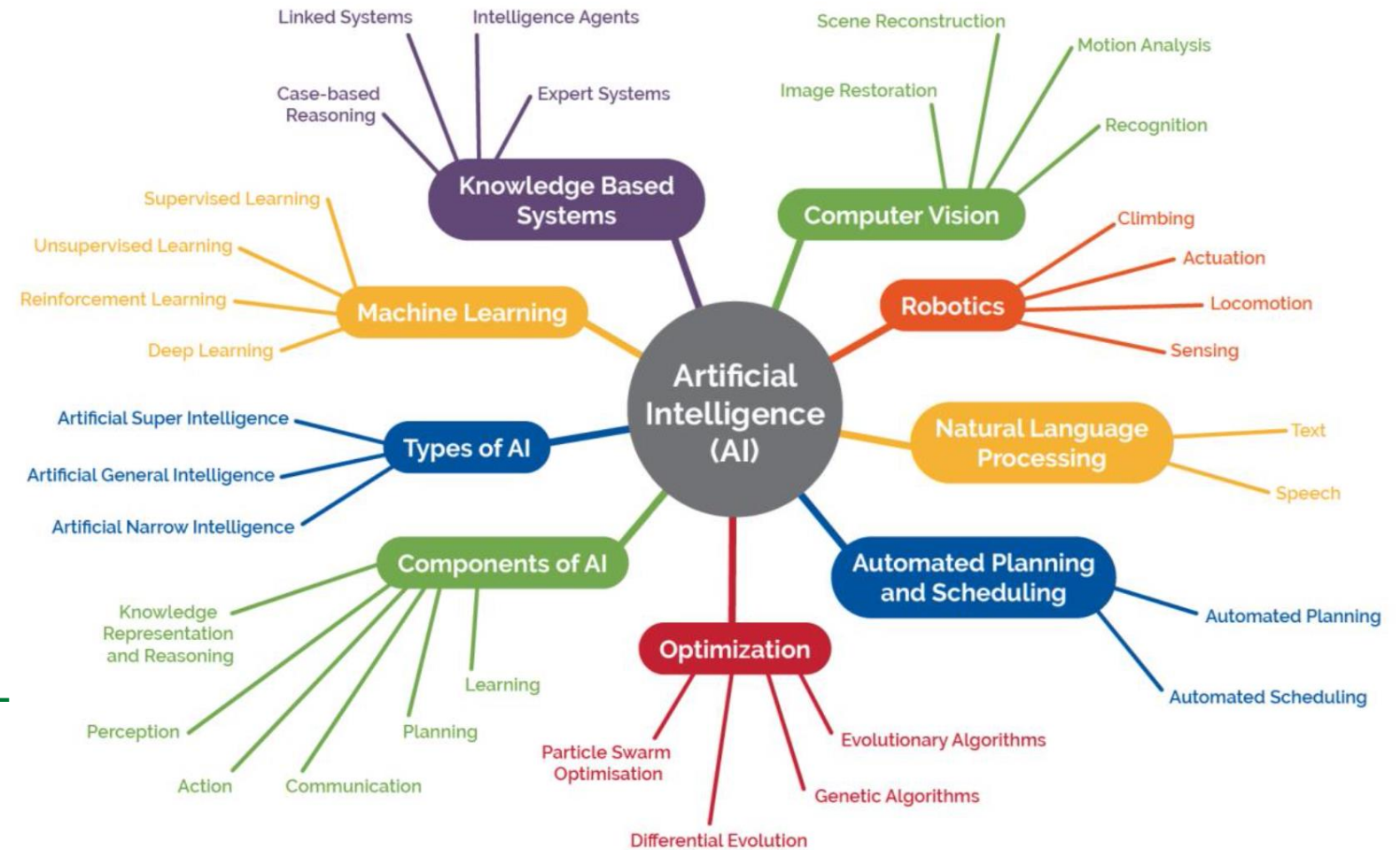
“The theory and development of computer systems able to perform tasks normally requiring human intelligence such as, visual perception, speech recognition, learning, decision-making, and natural language processing.”

Perspective: An Algorithm that Pursues a Goal

“Any computational method that is made to act independently towards a goal based on inferences from theory or patterns in data.”

Perspective: Intelligence Augmentation

“Augmented intelligence is a design pattern for a human-centered partnership model of people and artificial intelligence (AI) working together to enhance cognitive performance, including learning, decision making, and new experiences.”



Large Language Models (LLMs) are trained on massive amounts of data in order to understand and respond to natural language instructions called prompts.

Clean Energy Future

What Are Interconnection Queues?

Grid operators require projects seeking to connect to the grid to undergo a series of impact studies, to insure the grid will remain safe, stable, and reliable when new generators plug in. This process establishes what new transmission upgrades are needed before a project can connect to the system, and then estimates and assigns the costs of those upgrades to the project and/or transmission owner. Projects in this process are known to be in the interconnection queue.



Queued Up... But in Need of Transmission

Unleashing the Benefit of Clean Power with Grid Infrastructure

The nation needs transmission infrastructure to unlock the enormous benefits and opportunities that the clean energy transition presents from spurring economic growth, to revitalizing domestic manufacturing, to creating millions of good jobs for American workers. Moreover, studies of benefit find that the benefits of transmission exceed the costs, by enabling access to low-cost generation, helping to maintain reliability and avoid power outages, and supporting clean energy supply.

Yet, a large amount of potential clean power capacity is struggling with the wait times and costs of connecting to the transmission grid, and the construction of new high-voltage transmission lines has declined over the last decade. To alleviate



the growing gridlock, transmission planning and interconnection processes need reform. Permitting and allocating costs for transmission also pose barriers, both for generator interconnection and regional and inter-regional grid infrastructure.

The Bipartisan Infrastructure Law contains important economic programs and authorities to help kick-start transmission investments. The proposed climate and clean energy incentives package in Congress would go much further in supporting large-scale transmission investment, including through a 30% investment tax credit.

Beyond these two Acts—one a law and one a proposed law—the U.S. Department of Energy is working to support transmission investment through the 'Building a Better Grid' Initiative. Actions by the Federal Energy Regulatory Commission (FERC), regional planning organizations, grid operators, states, utilities, and others will also play critical roles in facilitating and maximizing the

benefits of new transmission. An all-of-government and all-of-society approach is crucial to fully realize the benefits of a modernized grid and move the nation forward to a more secure and equitable clean energy future for all Americans.

Queued-Up

The total amount of new electric generation capacity needed to meet ambitious 2030 clean energy goals is already in the early development pipeline.

More than 930 gigawatts (GW) of solar, wind, hydropower, geothermal, and nuclear capacity are currently sitting in interconnection queues seeking transmission access, along with over 420 GW of energy storage (Figure 1).¹ This is roughly the same amount of clean capacity needed to hit an 80% clean electricity share in 2030. It is also a large step towards the capacity needed to reach 100% clean electricity in 2035 under accelerated electrification, consistent with the nation's decarbonization commitments.²



Grid connection backlog grows by 30% in 2023, dominated by requests for solar, wind, and energy storage

April 10, 2024

With grid interconnection reforms underway across the country, a Berkeley Lab-led study shows nearly 2,600 gigawatts of energy and storage capacity in transmission grid interconnection queues

The backlog of new power generation and energy storage seeking transmission connections across the U.S. grew again in 2023, with nearly 2,600 gigawatts (GW) of generation and storage capacity now actively seeking grid interconnection, according to new research from Lawrence Berkeley National Laboratory (Berkeley Lab). Active capacity in U.S. interconnection queues increased nearly eight-fold over the last decade, and is now more than twice the total installed capacity of the existing U.S. power plant fleet. The queues indicate particularly strong interest in solar, battery storage, and wind energy, which together accounted for over 95% of all active capacity at the end of 2023.

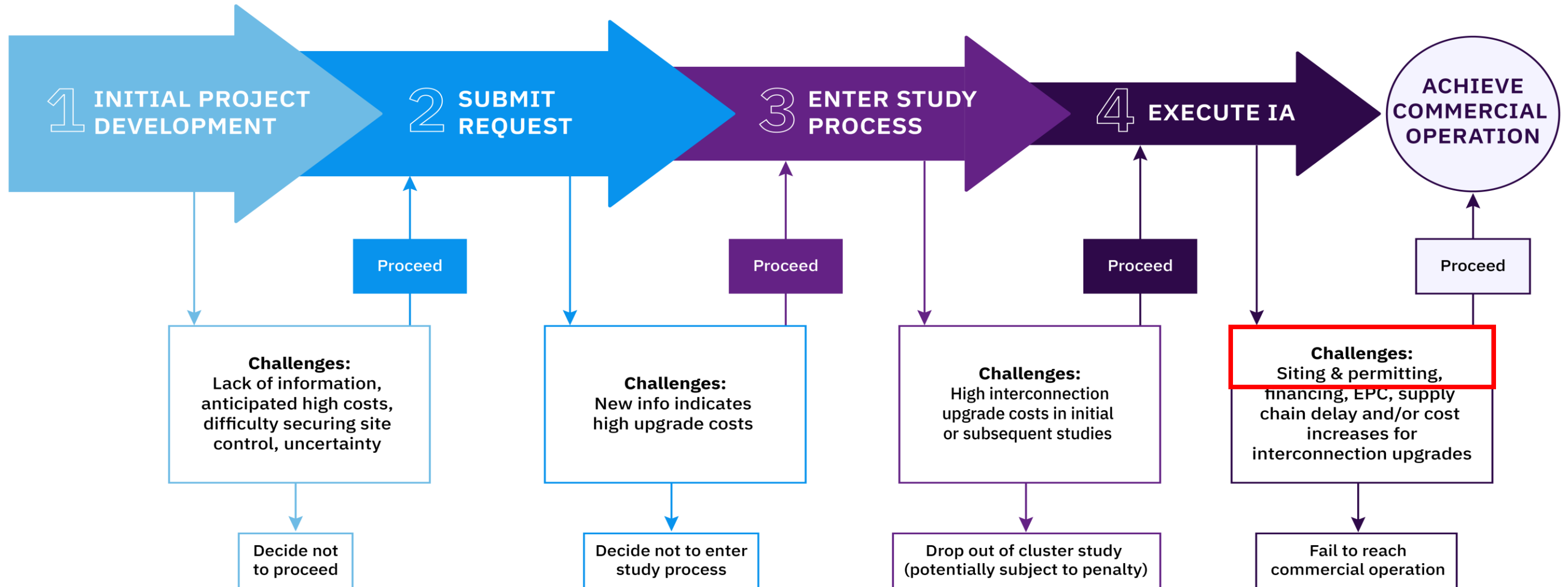


But this growing backlog has become a major bottleneck for project development: proposed projects are mired in lengthy and uncertain interconnection study processes, and most interconnection requests are ultimately cancelled and withdrawn. The Federal Energy Regulatory Commission (FERC) adopted major interconnection reforms in 2023 that have not yet taken effect in most regions; project developers

¹ Rand et al. 2022. "Queued Up: Characteristics of Power Plants Seeking Transmission Interconnection As of the End of 2021." Berkeley Lab.

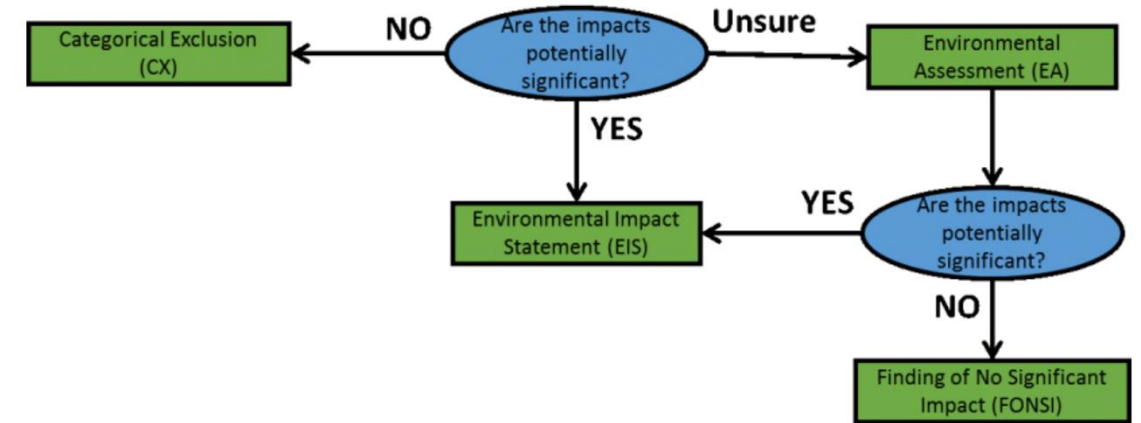
² An 80% clean electricity scenario for 2030 estimates the need for ~950 GW of new clean power capacity and ~225 GW of storage (Abyankar et al. 2021. "2030 Report: Powering America's Clean Economy." UC Berkeley, Goldman School of Public Policy.). A separate study from the U.S. Department of Energy assesses a scenario that reaches ~70% clean by 2030, envisioning ~510 GW of additional clean power capacity and 60 GW of storage by 2030 (DOE 2021. "Solar Futures Study." U.S. Department of Energy.). Finally, the Long-Term Strategy of the United States establishes a pathway to net-zero greenhouse gas emissions by 2050, inclusive of a 100% clean electricity share by 2035; it requires 1,680-1,800 GW of new clean power capacity by 2035 as well as 130-150 GW of battery storage (United States Executive Office of the President. 2021. "The Long-Term Strategy of the United States: Pathways to Net-Zero Greenhouse Gas Emissions by 2050." Washington, DC).

Challenges in Interconnection Queues

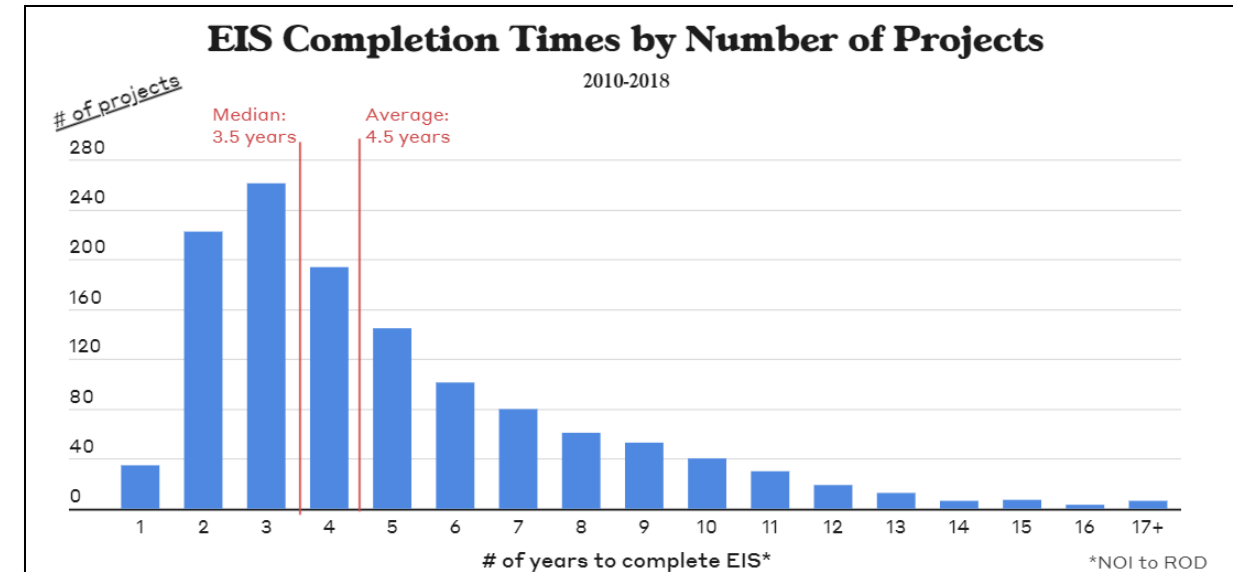


Environmental Reviews

- The National Environmental Policy Act (NEPA) requires agencies to examine and disclose the potential significant environmental impacts of major actions
- NEPA does not require a substantive result, it only requires that agencies take a "hard look" at the impacts of their actions
- Three main levels of environmental reviews:
 - Environmental Impact Statement – for actions likely to have a significant impact
 - Environmental Assessment – for actions that may have a significant impact (EA results in either a Finding of No Significant Impact or a decision to prepare an EIS)
 - Categorical Exclusion – for actions that normally do not have a significant impact
- Typical NEPA timelines for site-specific renewable energy projects:
 - Environmental Impact Statement: 2.5 - 4 years
 - Environmental Assessment: 6-18 months
 - Categorical Exclusions: a few weeks to 6 months.




Simple Overview of NEPA Process




Source: Council on Environmental Quality

Recent Environmental Reviews




**SunZia
Southwest
Transmission
Project**
Permitting Success Story



SunZia Southwest Transmission, a 550 mile transmission line project transporting renewable energy to residents in the southwest. The project will support modernizing renewable energy infrastructure, potentially lowering energy costs for consumers in AZ, NM, & CA.




**Coastal
Virginia
Offshore Wind
Project**
Permitting Success Story



Coastal Virginia Offshore Wind farm is the largest offshore wind project in U.S. history, expected to create 900 direct and indirect jobs and power up to 660,000 homes with renewable energy.

Origins and Initial Steps

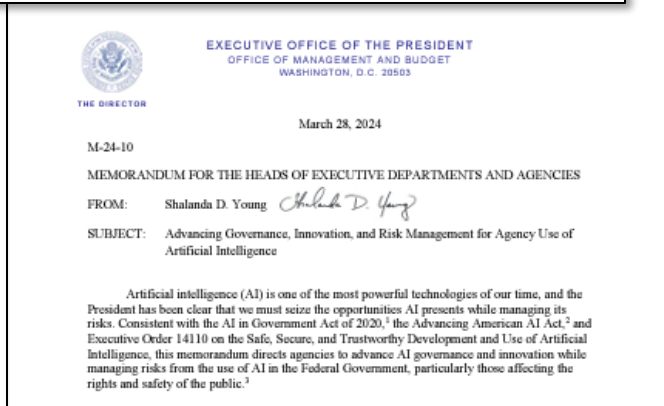
Executive Order 14110



<https://www.whitehouse.gov...>



OMB M-24-10

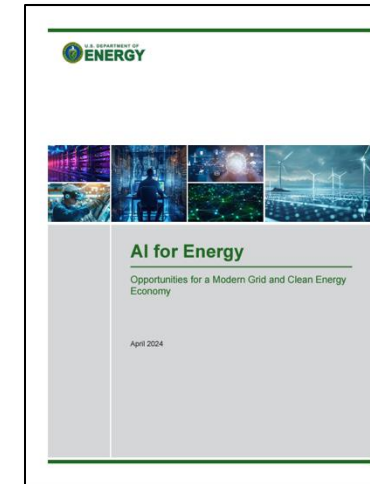


ACTIONS

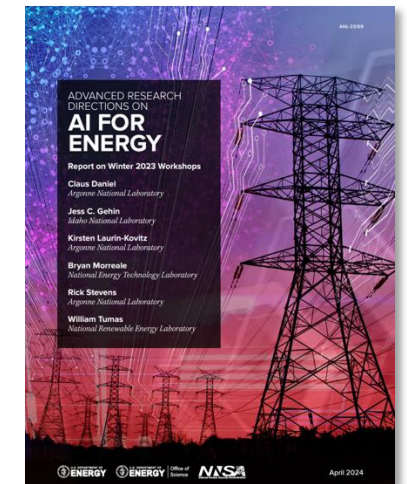
The U.S. Department of Energy (DOE) **has announced many actions** to assess opportunities and challenges of AI for purposes of accelerating deployment of clean energy and managing growing energy demand.

These actions include coordination with regulators, researchers, utilities, clean energy developers, data center owners and operators, and other interested parties.

REPORTS

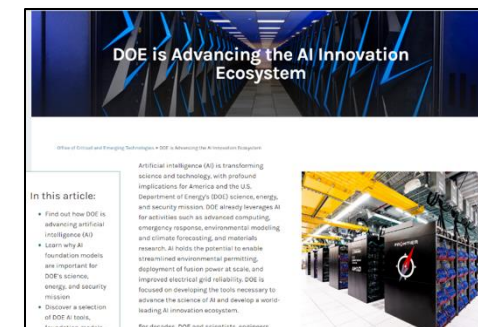


DOE 2024

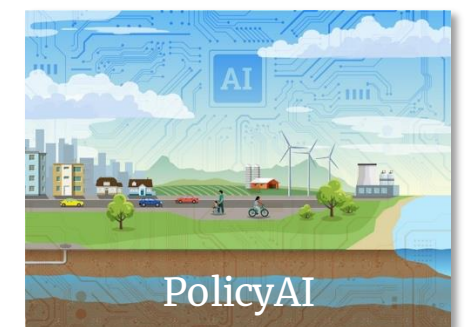


DOE 2024

TOOLS

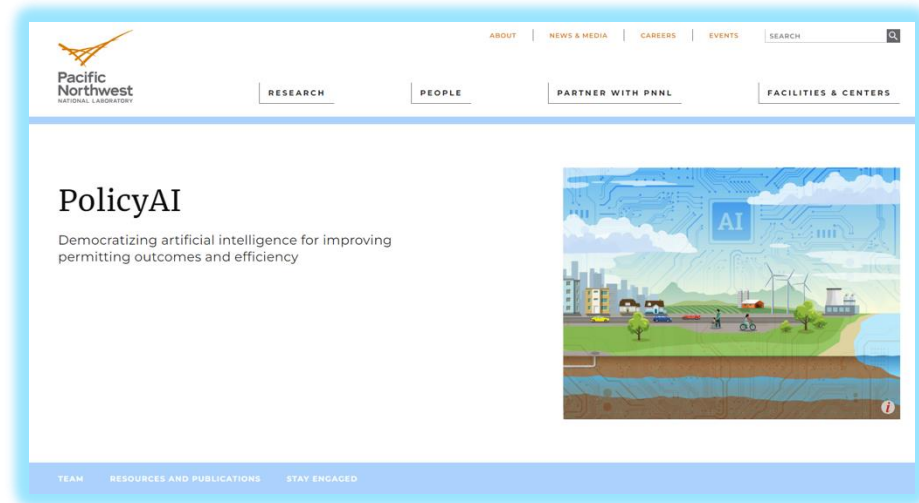


<https://www.energy.gov...>



<https://www.pnnl.gov...>

PolicyAI Overview



<https://www.pnnl.gov...>

Timeline

Current status: Research and development, pilot and v1 applications, interagency agreements and feedback

1–2 years

AI-enabled pilots improving permitting workflows

5 years

Operationalized AI models streamlining permitting

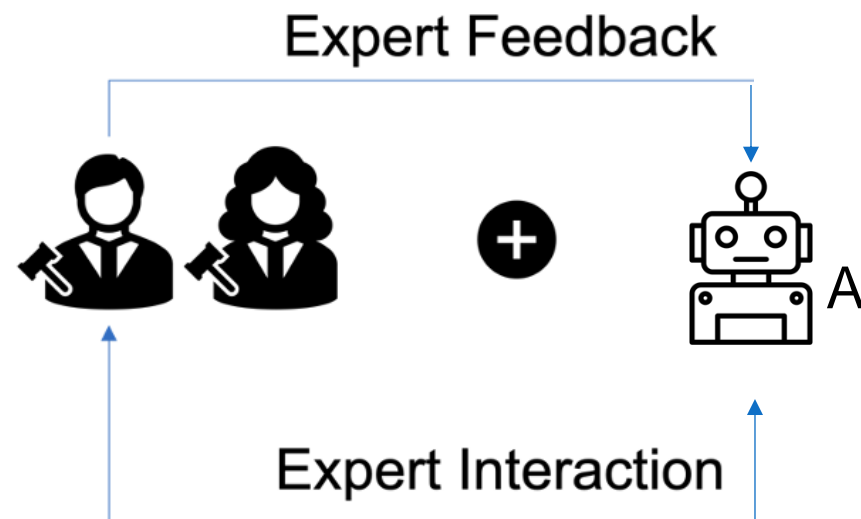
- PolicyAI is the anchor project in DOE’s \$20 million VoltAIc Initiative that includes support from the Permitting Council
- DOE partnered with the Pacific Northwest National Laboratory (PNNL) to develop PolicyAI
- Includes coordination with the Council on Environmental Quality (CEQ), various federal agencies, and industry
- PolicyAI tools are intended to be adaptable for use by multiple federal agencies

AI-Driven Environmental Review and Permitting

Critical Opportunity

Environment and permitting process is tedious, expensive and time taking. AI driven tools will assist in improving and streamlining the review process.

National Environmental Policy Act (NEPA) experts work to ensure compliance with environmental laws and regulations. NEPA experts interpret laws; understand and respond to public, private, governmental, and tribal input; and work with applicants to properly analyze and mitigate environmental impacts of federal actions.



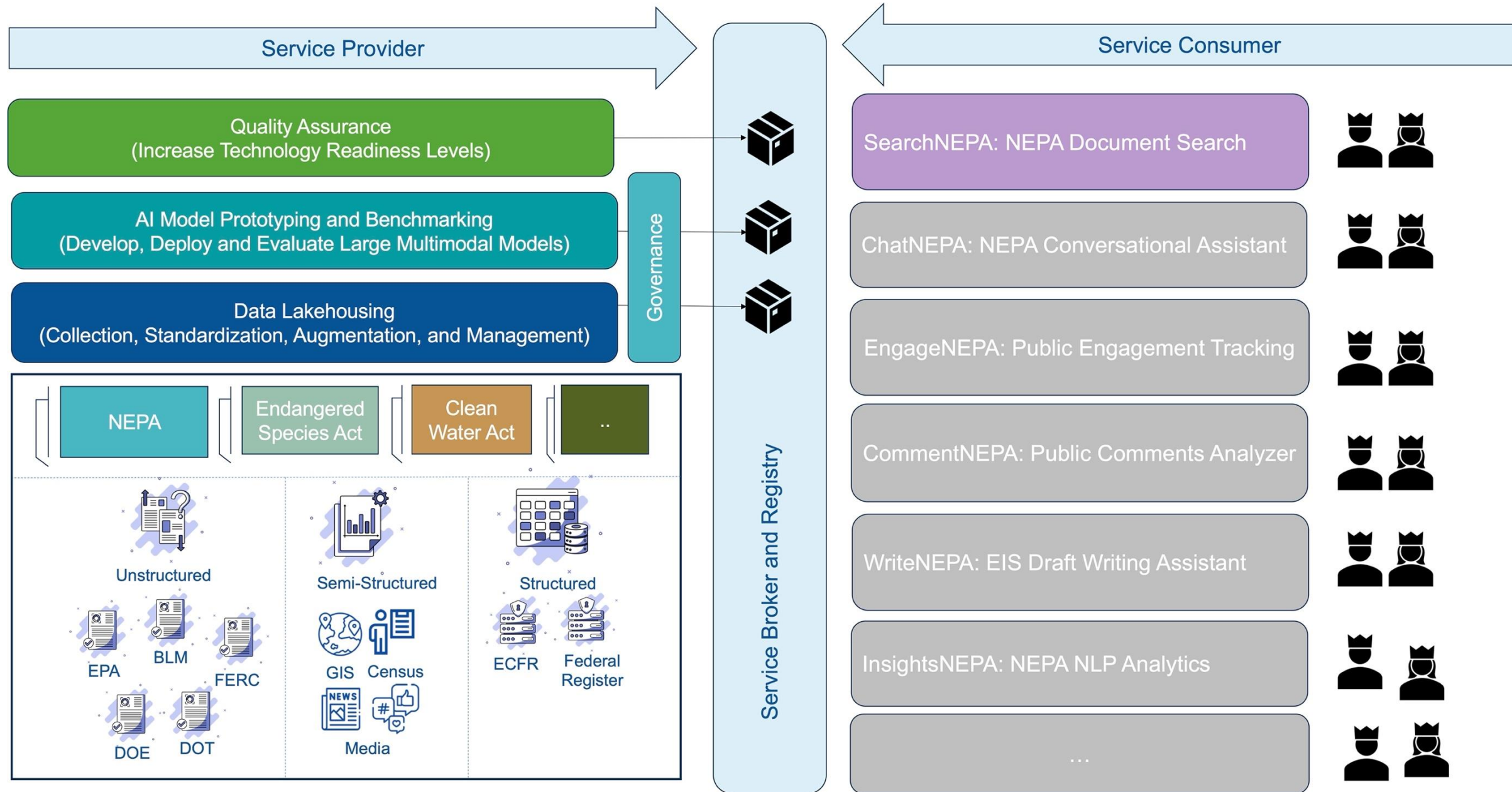
PolicyAI project is developing AI tools to inform future environmental reviews by synthesizing information from thousands of existing environmental review documents for the purpose of efficiency gains, identification of otherwise unseen trends, and the creation of a comprehensive map and catalog of all National Environmental Policy Act (NEPA) efforts.

[Visit PolicyAI website to learn more.](#)

Risk Based AI Integration to NEPA Workflow



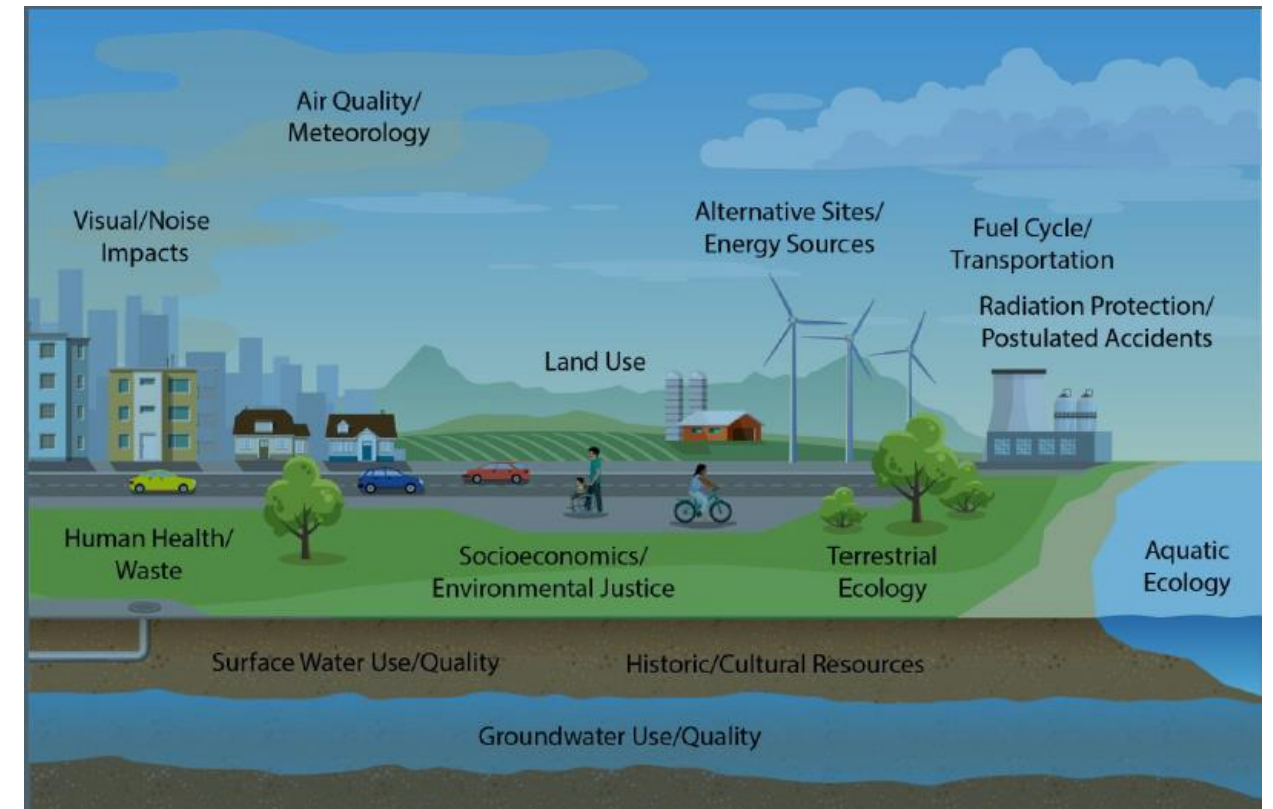
PolicyAI Service Oriented Architecture



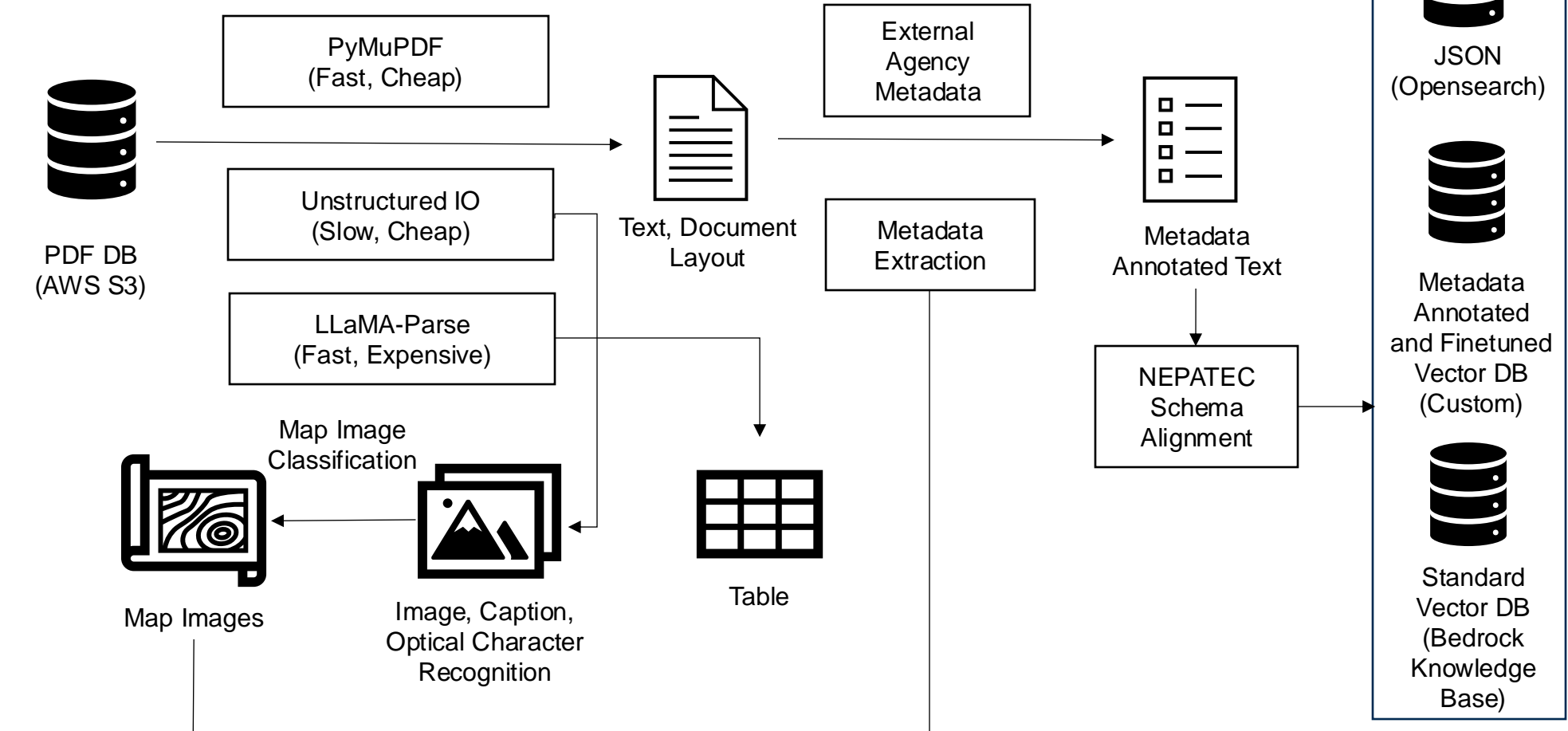
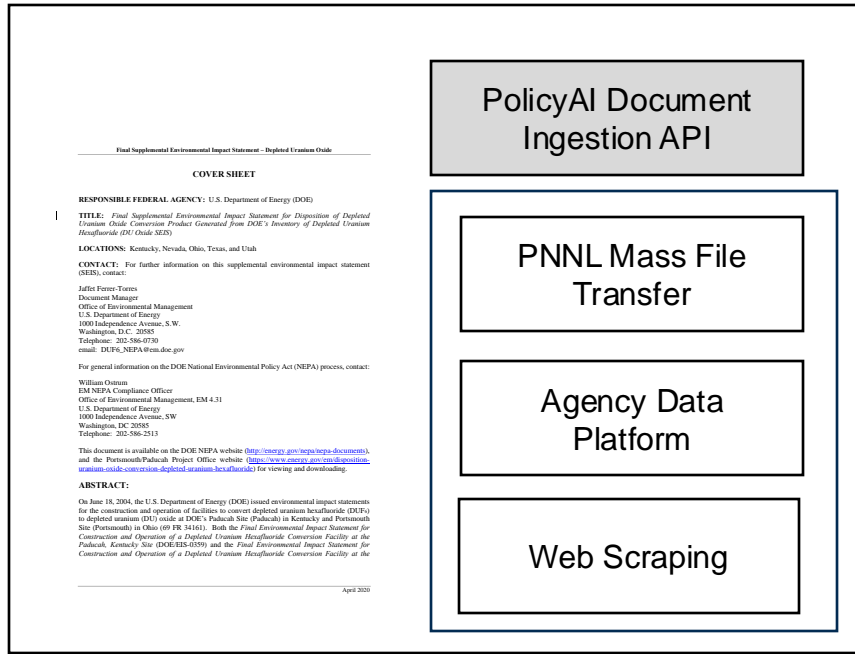
*The list of applications is subject to change based on the sponsor request

Anatomy of a NEPA Document

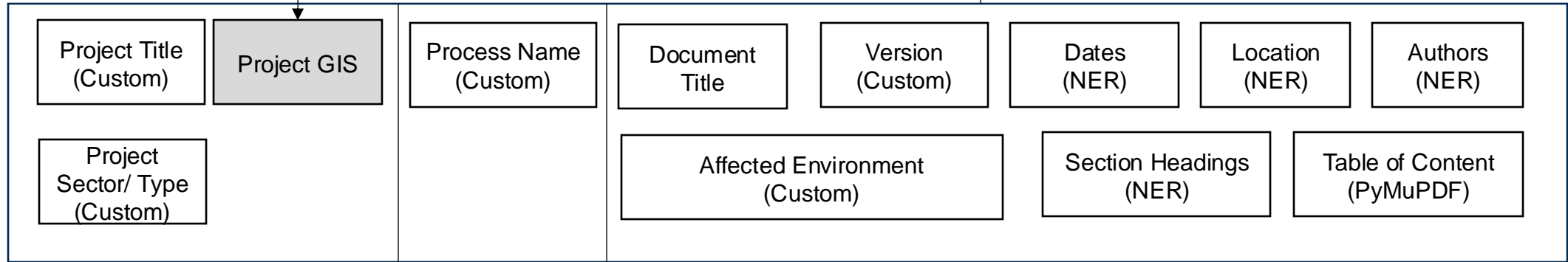
1. Purpose and Need/Proposed Action Description
2. Affected Environment – Baseline conditions
 - a. Land Use/Visual/Transportation
 - b. Geology/Soils
 - c. Hydrology (groundwater/surface water)
 - d. Ecology (terrestrial/aquatic)
 - e. Air Quality/Meteorology/Climate Change
 - f. Historic & Cultural Resources
 - g. Human Health/Noise
 - h. Socioeconomics
 - i. Environmental Justice
 - j. Waste
 - k. Project Specific Hazards
3. Resource impact assessments from construction and operation
4. Cumulative impacts from other actions
5. Alternatives to the proposed action and environmental impacts
6. Mitigations/Conclusions



NEPA Data Lakehousing



Data Source	Status (09/24)
EPA (NEPATEC1.0)	Completed
DOE (EIS, EA, CE)	Completed
BOEM SOCS	Completed
USDA	Completed
BLM	In-progress



*Gray color boxes highlight work in progress components

NEPA Text Corpus (NEPATEC) – Project Sector

Energy Production and Management

Carbon Capture and Sequestration	Conventional Energy Production	Renewable Energy Production
	<ul style="list-style-type: none"> • Coal • Land-based Oil & Gas • Nuclear • Offshore Oil and Gas • Rural Energy • Other 	<ul style="list-style-type: none"> • Biomass • Energy Storage • Geothermal • Hydrokinetic • Hydropower • Solar • Wind • Offshore • Onshore

Land Development and Urban Planning

Land Development - Housing	Land Development - Urban	Land Development - Other	Public and Recreational Land Use
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Materials and Manufacturing

Manufacturing	Mining - Metals	Mining - Non-Metallic Minerals
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Transportation and Infrastructure

Aviation	Broadband	Electricity Transmission	Pipelines	Ports and Waterways	Surface Transportation
<ul style="list-style-type: none"> • Airports and Air Traffic • Commercial Space 					<ul style="list-style-type: none"> • Bridges • Highways and Roads • Public Transportation • Railroads • Utilities (electricity, gas, telecommunications) • Others

Agriculture and Natural Resource Management

Agriculture	Ecosystem Management and Restoration	Habitat Conservation Plan	Land Use or Forest Management Plan	Rangeland Management	Threatened and Endangered Species Management
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Military, Defense, and Emergency Response

Emergency and Disaster Response	Military and Defense
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Technology and Data Management

Artificial Intelligence and Machine Learning	Cybersecurity	Data Storage and Data Management	Performance Computing and Advanced Computer Hardware and Software	Quantum Information Science and Technology	Semiconductors
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Water and Waste Management

Waste Management	Water Resources
	<ul style="list-style-type: none"> • Irrigation and Water Supply • Other



SearchNEPA

Production Application for NEPA
Document Search



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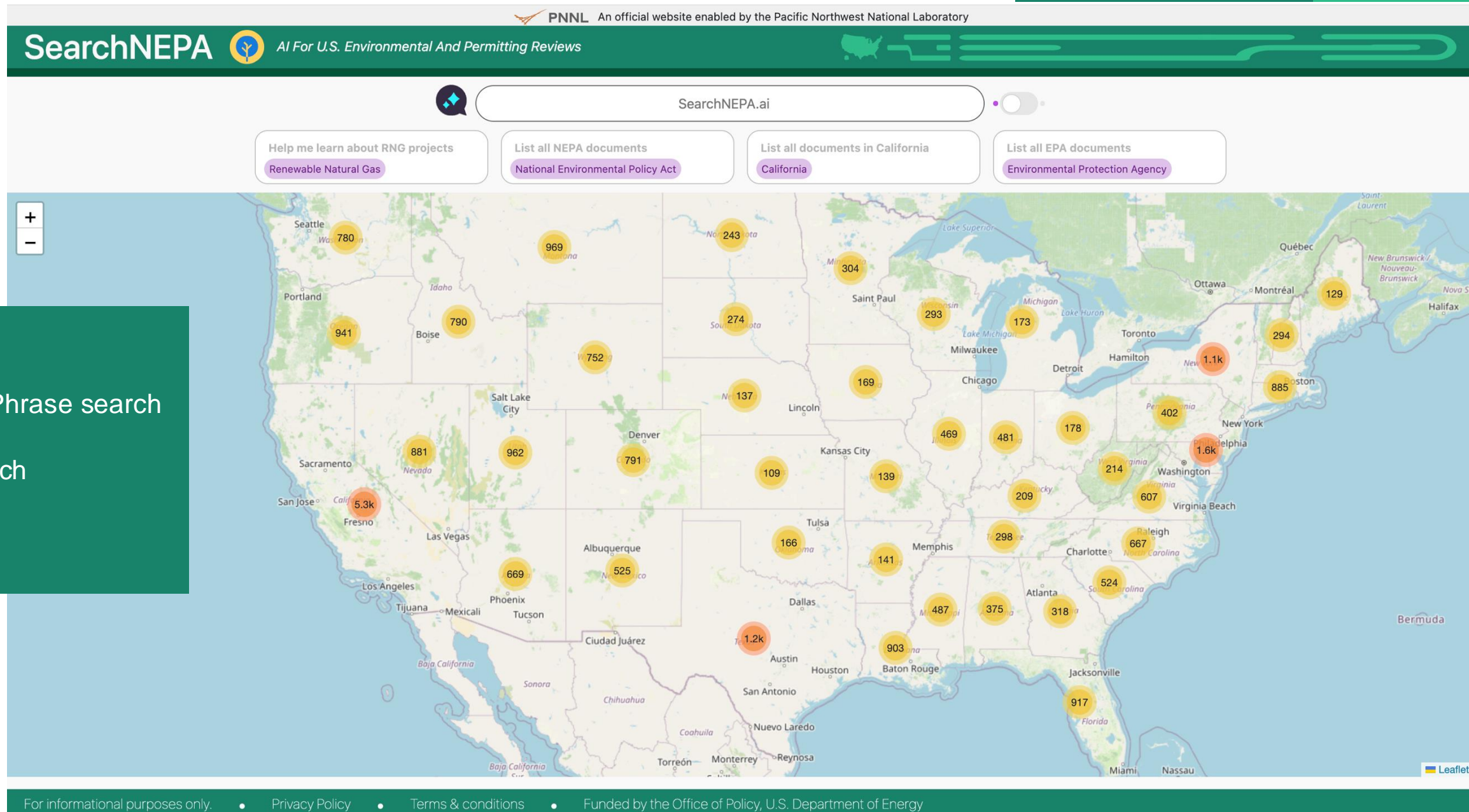
SearchNEPA

Standard Document Full Text Search

<https://policyai.pnnl.gov/searchnepa/>

Home

Version 1.0



The screenshot shows the SearchNEPA website interface. At the top, there is a navigation bar with the PNNL logo and the text "PNNL An official website enabled by the Pacific Northwest National Laboratory". Below this is a dark green header with the "SearchNEPA" logo and the tagline "AI For U.S. Environmental And Permitting Reviews". A search bar is prominently displayed with the text "SearchNEPA.ai" and a toggle switch. Below the search bar are four filter buttons: "Help me learn about RNG projects" (with a sub-button for "Renewable Natural Gas"), "List all NEPA documents" (with a sub-button for "National Environmental Policy Act"), "List all documents in California" (with a sub-button for "California"), and "List all EPA documents" (with a sub-button for "Environmental Protection Agency"). The main content area features a map of the United States with numerous yellow circular markers indicating document counts for various cities and states. For example, San Jose, CA has 5.3k documents, and Washington, DC has 1.6k. Other cities shown include Seattle (780), Portland (941), Boise (790), Salt Lake City (962), Denver (791), Kansas City (139), Chicago (469), Detroit (173), Toronto (294), New York (1.1k), Philadelphia (1.6k), Los Angeles, Phoenix, Tucson, Dallas, Memphis, Charlotte, Atlanta, Austin, Houston, Baton Rouge, Jacksonville, and Miami. The map includes a zoom-in (+) and zoom-out (-) control on the left side. At the bottom of the page, there is a footer with the text "For informational purposes only." followed by links for "Privacy Policy", "Terms & conditions", and "Funded by the Office of Policy, U.S. Department of Energy".

Features

- Search Bar with
 - Keyword/Concept/Phrase search
 - Compound search
 - Prompt GenAI search
- GenAI ON/OFF Toggle
- Suggested Search Terms
- Document map

G-1

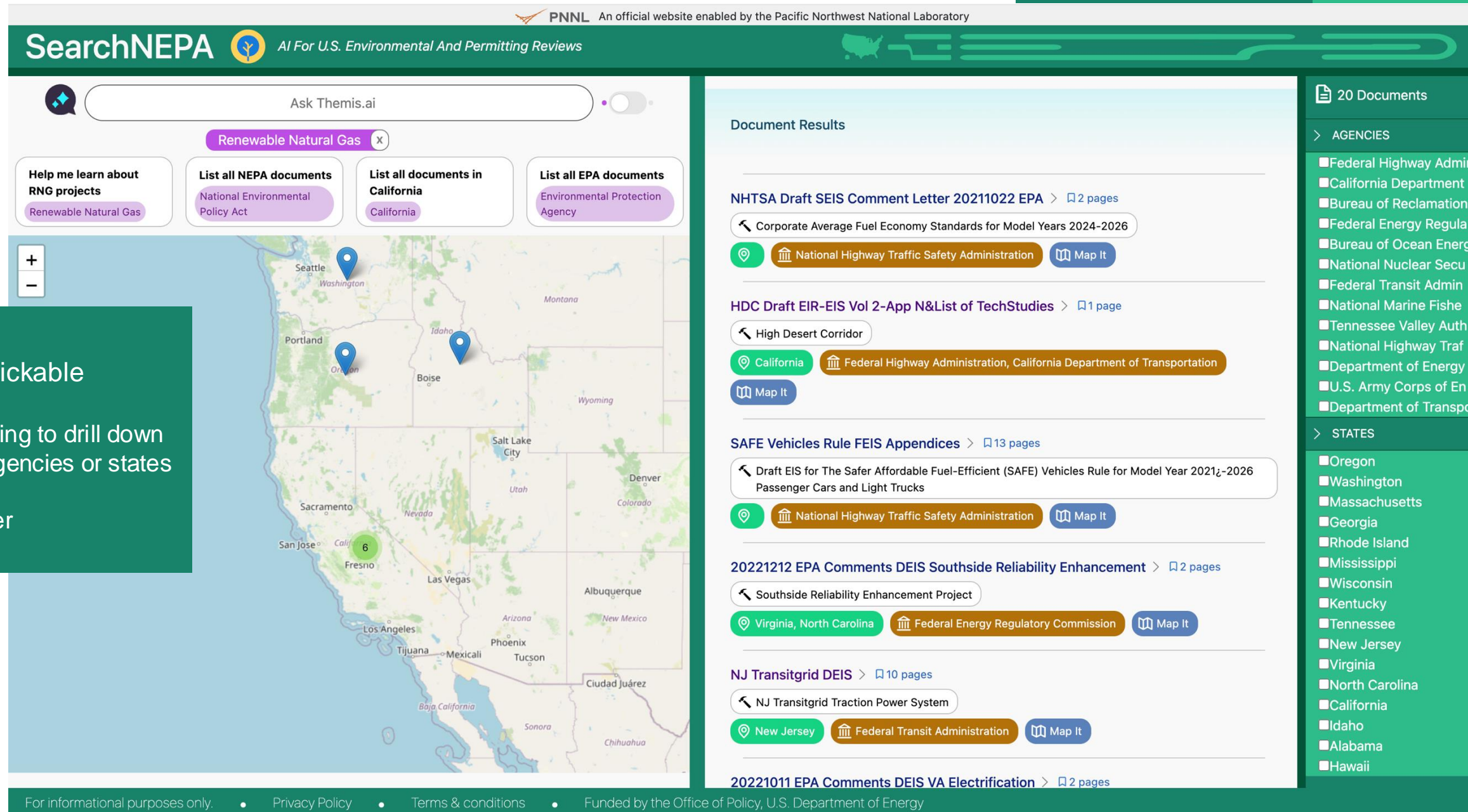
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SearchNEPA

Standard Document Full Text Search

<https://policyai.pnnl.gov/searchnepa/>

Keyword Search Version 1.0



The screenshot shows the SearchNEPA web application interface. At the top, it features the PNNL logo and the text "An official website enabled by the Pacific Northwest National Laboratory". The main header includes "SearchNEPA" and "AI For U.S. Environmental And Permitting Reviews". Below the header is a search bar with the placeholder "Ask Themis.ai" and a toggle switch. A filter tag "Renewable Natural Gas" is active. There are four filter buttons: "Help me learn about RNG projects", "List all NEPA documents", "List all documents in California", and "List all EPA documents". A map of the United States is displayed with several location pins. The right sidebar shows "20 Documents" and lists agencies and states. The main content area displays document results with titles, page counts, and agency information.

Features

- Document Results with clickable metadata for
 - Quick post-search filtering to drill down into specific set(s) of agencies or states
 - Map zoom in
 - Link to document viewer
 - Link to project viewer

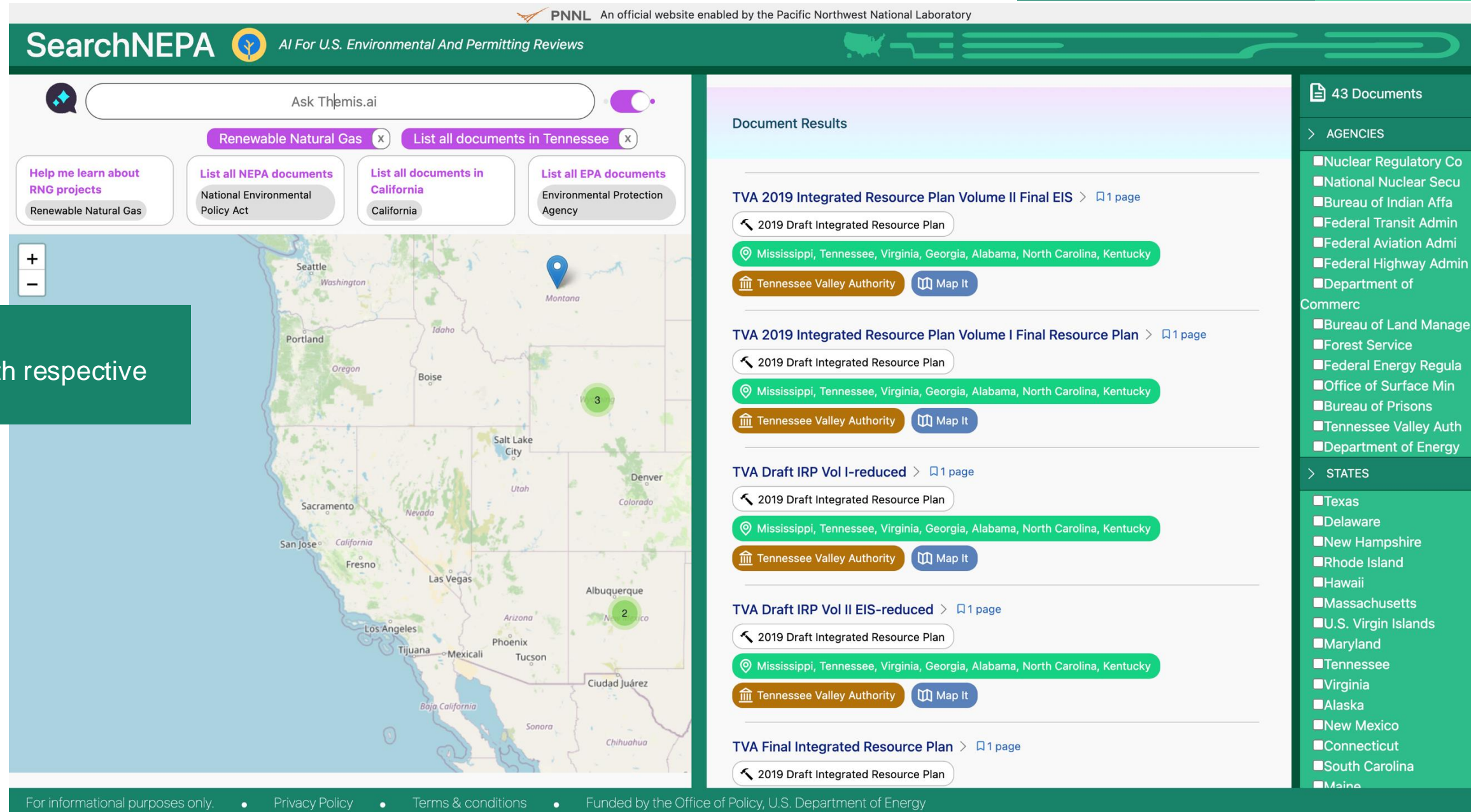
SearchNEPA

Standard Document Full Text Search

<https://policyai.pnnl.gov/searchnepa/>

GenAI Search

Version 1.0



PNNL An official website enabled by the Pacific Northwest National Laboratory

SearchNEPA AI For U.S. Environmental And Permitting Reviews

Ask Themis.ai

Renewable Natural Gas x List all documents in Tennessee x

Help me learn about RNG projects Renewable Natural Gas

List all NEPA documents National Environmental Policy Act

List all documents in California California

List all EPA documents Environmental Protection Agency

Map showing search results for Tennessee (3) and California (2).

Document Results

TVA 2019 Integrated Resource Plan Volume II Final EIS > 1 page

2019 Draft Integrated Resource Plan

Mississippi, Tennessee, Virginia, Georgia, Alabama, North Carolina, Kentucky

Tennessee Valley Authority Map It

TVA 2019 Integrated Resource Plan Volume I Final Resource Plan > 1 page

2019 Draft Integrated Resource Plan

Mississippi, Tennessee, Virginia, Georgia, Alabama, North Carolina, Kentucky

Tennessee Valley Authority Map It

TVA Draft IRP Vol I-reduced > 1 page

2019 Draft Integrated Resource Plan

Mississippi, Tennessee, Virginia, Georgia, Alabama, North Carolina, Kentucky

Tennessee Valley Authority Map It

TVA Draft IRP Vol II EIS-reduced > 1 page

2019 Draft Integrated Resource Plan

Mississippi, Tennessee, Virginia, Georgia, Alabama, North Carolina, Kentucky

Tennessee Valley Authority Map It

TVA Final Integrated Resource Plan > 1 page

2019 Draft Integrated Resource Plan

43 Documents

AGENCIES

- Nuclear Regulatory Co
- National Nuclear Secu
- Bureau of Indian Affa
- Federal Transit Admin
- Federal Aviation Admi
- Federal Highway Admin
- Department of
- Commerc
- Bureau of Land Manage
- Forest Service
- Federal Energy Regula
- Office of Surface Min
- Bureau of Prisons
- Tennessee Valley Auth
- Department of Energy

STATES

- Texas
- Delaware
- New Hampshire
- Rhode Island
- Hawaii
- Massachusetts
- U.S. Virgin Islands
- Maryland
- Tennessee
- Virginia
- Alaska
- New Mexico
- Connecticut
- South Carolina
- Maine

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Features

- Prompt GenAI Search with respective Document Results

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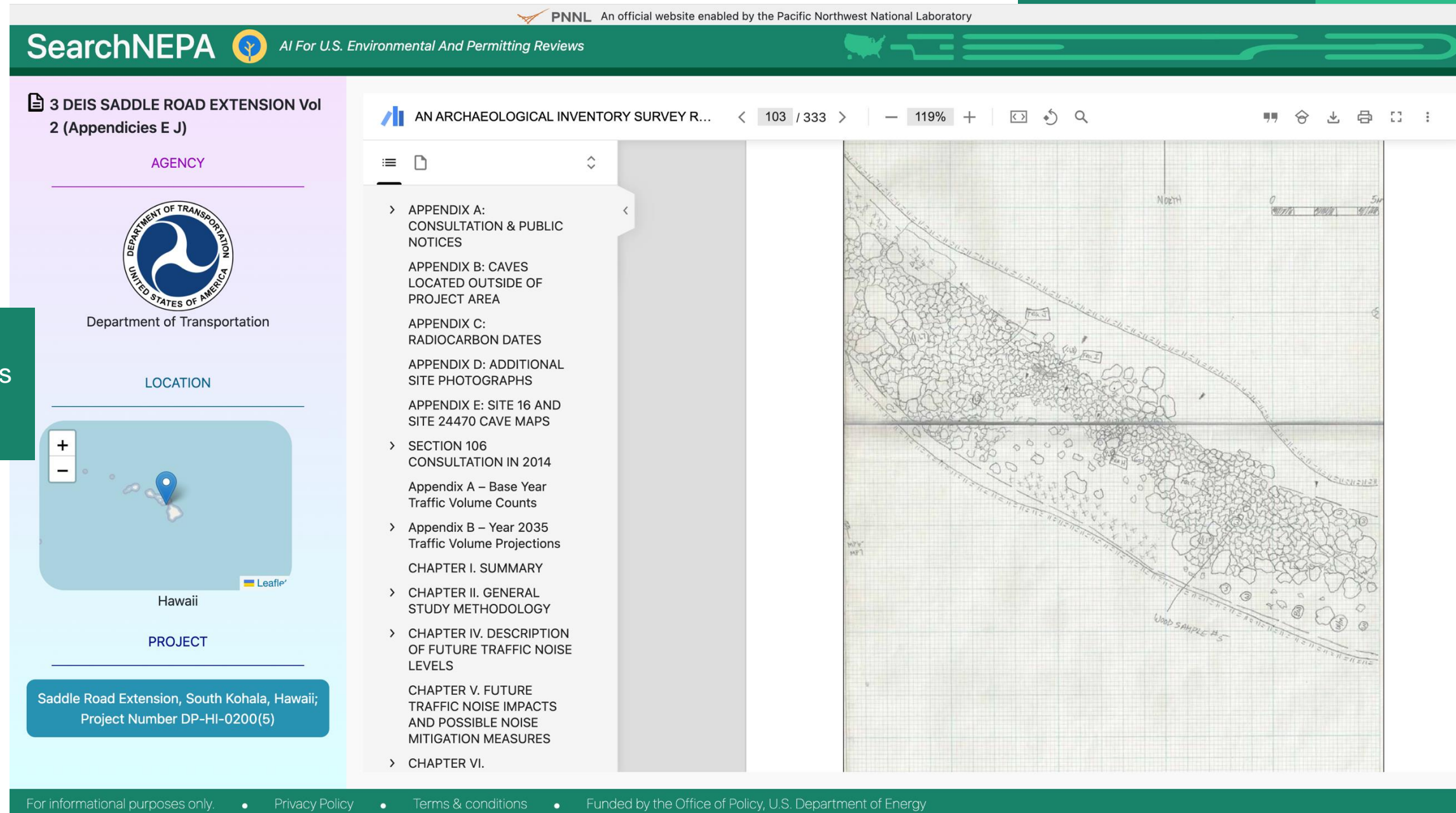
SearchNEPA

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Document Viewer

Version 1.0



SearchNEPA AI For U.S. Environmental And Permitting Reviews

3 DEIS SADDLE ROAD EXTENSION Vol 2 (Appendicies E J)

AGENCY

Department of Transportation

LOCATION

Hawaii

PROJECT

Saddle Road Extension, South Kohala, Hawaii; Project Number DP-HI-0200(5)

AN ARCHAEOLOGICAL INVENTORY SURVEY R... 103 / 333 119%

- APPENDIX A: CONSULTATION & PUBLIC NOTICES
- APPENDIX B: CAVES LOCATED OUTSIDE OF PROJECT AREA
- APPENDIX C: RADIOCARBON DATES
- APPENDIX D: ADDITIONAL SITE PHOTOGRAPHS
- APPENDIX E: SITE 16 AND SITE 24470 CAVE MAPS
- SECTION 106 CONSULTATION IN 2014
 - Appendix A – Base Year Traffic Volume Counts
 - Appendix B – Year 2035 Traffic Volume Projections
- CHAPTER I. SUMMARY
- CHAPTER II. GENERAL STUDY METHODOLOGY
- CHAPTER IV. DESCRIPTION OF FUTURE TRAFFIC NOISE LEVELS
- CHAPTER V. FUTURE TRAFFIC NOISE IMPACTS AND POSSIBLE NOISE MITIGATION MEASURES
- CHAPTER VI.

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Features

- Displays document and its associated metadata
- Link to project viewer

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<https://policyai.pnnl.gov/searchnepa/>

Project Viewer

Version 1.0

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SearchNEPA  AI For U.S. Environmental And Permitting Reviews

Crimson Solar Project Draft Environmental Impact Statement and Environmental Impact Report and Draft Land Use Plan Amendment to the California Desert Conservation Area Plan

DOCUMENT
DETAILS

AGENCY

LOCATION
California

TOTAL
DOCUMENTS
74



Bureau of Land
Management

Features

- Displays project and its associated documents and metadata
- Links to documents

DOCUMENTS

- [Crimson Solar Draft EIS-EIR-PA](#)
- [Crimson Solar Draft EIS-EIR-PA Appendix A-C](#)
- [Crimson Solar Draft EIS-EIR-PA Appendix D](#)
- [Crimson Solar Draft EIS-EIR-PA Appendix E-J](#)
- [Crimson Solar Draft EIS-EIR-PA Appendix K-T](#)
- [Crimson Solar Drait EIS-EIR-PA Appendix U](#)
- [Crimson Solar Final EIS-PA](#)
- [Crimson Solar Final EIS-PA Appendix A-J](#)
- [Crimson Solar Final EIS-PA Appendix K-U](#)
- [Crimson Solar Final EIS-PA Appendix V-W](#)
- [2021-3-15 EPA Comments FEIS Crimson Solar signed](#)
- [Desert Quartzite EISEIR Appendix K Traffic Analysis Report 508](#)
- [Desert Quartzite EISEIR Appendix Q Phase I ESA Report checked](#)
- [Desert Quartzite EISEIR Appendix V Drainage Report ready 508](#)
- [Desert Quartzite EISEIR Appendix M Biological Resources Technical Report and WEST Memo checked \(1\)](#)
- [Desert Quartzite EISEIR Appendix J Weed Management Plan ready 508](#)



ChatNEPA

Demo Application for NEPA Fact Finding and Topic Summarization



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ChatNEPA: NEPA Fact Finding Copilot

PolicyAI Copilot V0.021

Agency Name

Choose an option

- Fish_and_Wildlife_Service
- FWS
- Office_of_Surface_Mining
- Utah_Department_of_Transportation
- Missile_Defense_Agency
- Bonneville_Power_Administration
- National_Marine_Fisheries_Service
- Federal_Reserve_Bank_of_San_Francisco

Features:

- Chat with NEPA Documents
- 100+ Agency wide NEPA documents
- Trustworthy Model Predictions

PolicyAI Copilot V0.021

Agency Name

Bureau_of_Ocean_Energy_Management

Ask me a question about NEPA docs!

Describe The National Outer Continental Shelf (OCS) oil and gas exploration and development program

Based on the provided context, the National Outer Continental Shelf (OCS) oil and gas exploration and development program involves leasing areas of the OCS for oil and gas development. The Secretary of the Interior oversees the program and is required to balance resource development with environmental protection. A 2017-2022 leasing program identified certain areas, including some off the coast of Alaska, for leasing. The purpose is to make OCS resources available for development as required by the Outer Continental Shelf Lands Act. Environmental reviews are conducted to analyze potential impacts. The program aims to focus leasing on the most promising areas while protecting habitats and subsistence activities.

Source 1 (0.74) Source 2 (0.73) Source 3 (0.73)

[Outer Continental Shelf \(OCS\) Alaska Region, Cook Inlet Planning Area, Oil and Gas Lease Sale 258](#)

37 Alaska Oil and Gas Association.
38 State of Alaska Dept of Natural Resources, Alaska Departments of Environmental Conservation (ADEC) and Fish and Game (ADFG) and the Alaska Oil and Gas Conservation Commission (AOGCC).

Your question

Summarize the main concerns raised by commenters who discussed tribal consultation and the BOEM responses to those comments in the 2012–2017 Outer Continental Shelf (OCS) Oil and Gas Leasing Proposed Final Program. Output a Table where the first column list the comments and the second column list the corresponding BOEM responses.

Based on the provided context, I have summarized the main concerns raised by commenters regarding tribal consultation and BOEM's responses in the following table:

Commenter Concerns	BOEM Responses
Commenters stated BOEM failed to adequately consult with tribes and did not provide adequate opportunities for tribal input.	BOEM stated it conducted government-to-government consultation with tribes and provided opportunities for input throughout the process. BOEM acknowledged ongoing duty to consult and engage with tribes.
Commenters said BOEM did not adequately consider tribal cultural resources, subsistence uses, and treaty rights.	BOEM stated it considered potential impacts to tribal resources and will continue to do so through later stages of OCS planning. BOEM will work to avoid or mitigate impacts.
Commenters argued BOEM did not adequately address tribal concerns in the EIS analysis.	BOEM said it considered tribal input and concerns in developing the EIS analysis. BOEM stated it will continue to engage tribes as additional information becomes available.
Commenters stated BOEM should improve tribal consultation process and do more to address tribal concerns.	BOEM acknowledged it can improve consultation process and will continue to engage tribes to address concerns and mitigate impacts.


Source 1 (0.73) Source 2 (0.73) Source 3 (0.73)


ChatNEPA: NEPA Fact Finding Copilot


PolicyAI Copilot V0.021

Agency Name

Bureau_of_Land_Management ✕ ▼

 Ask me a question about NEPA docs!

 List down the federally recognized tribes that BLM invited to to participate as cooperating agencies in preparation of the SunZia Southwest Transmission Project EIS.

 Based on the provided context, the federally recognized tribes that the BLM invited to participate as cooperating agencies in preparation of the SunZia Southwest Transmission Project EIS are:

- Ak-Chin Indian Community
- Apache Tribe of Oklahoma
- Caddo Indian Tribe
- Comanche Indian Tribe
- Fort Sill Apache Tribe of Oklahoma
- Gila River Indian Community
- Hopi Tribe
- Jicarilla Apache Nation
- Kiowa Tribe of Oklahoma
- Mescalero Apache Tribe
- Navajo Nation

- Salt River Pima-Maricopa Indian Community
- San Carlos Apache Tribe
- Tohono O'odham Nation
- Tonto Apache Tribe
- White Mountain Apache
- Wichita and Affiliated Tribes
- Yavapai-Apache Nation
- Ysleta del Sur Pueblo

[Source 1 \(0.67\)](#) [Source 2 \(0.65\)](#) [Source 3 \(0.64\)](#)

[SunZia Southwest Transmission Project Right-of-Way Amendment](#)

 State: ADOT, AZGFD, ASLD, NMDGF, New Mexico Spaceport Authority, NMSLO, State of New Mexico Military Base Planning and Support

- Local: Arizona Counties (Cochise, Graham, Greenlee, Pima, Pinal), Arizona Cities (Coolidge, Eloy, Willcox), New Mexico Counties (Grant, Hidalgo, Lincoln, Luna, Sierra, Socorro, Torrance, Valencia), New Mexico Cities (Belen, Deming, Lordsburg, Socorro, Truth or Consequences)
- Tribes: Ak-Chin Indian Community, Apache Tribe of Oklahoma, Caddo Indian Tribe, Comanche Indian Tribe, Fort Sill Apache Tribe of Oklahoma, Gila River Indian Community, Hopi Tribe, Jicarilla Apache Nation, Kiowa Tribe of Oklahoma, Mescalero Apache Tribe, Navajo Nation, Pascua Yaqui Tribe, Pueblo of Acoma, Pueblo of Isleta, Pueblo of Jemez, Pueblo of Laguna, Pueblo of Sandia, Pueblo of Santo Domingo, Pueblo of Taos, Pueblo of Tesuque, Pueblo of Zuni,

ChatNEPA: NEPA Fact Finding Copilot

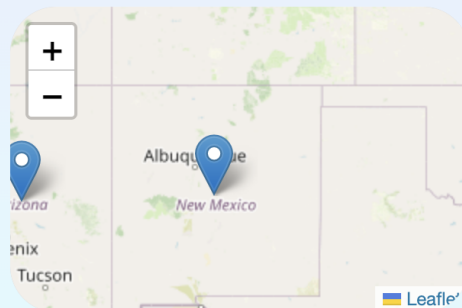
SunZia Southwest Transmission Project FEIS and Proposed RMP Amendments

AGENCY



Bureau of Land Management

LOCATION



New Mexico, Arizona, New Mexico

PROJECT

SunZia Southwest Transmission Project

- 1.11 BLM PLAN AMENDMENTS
- 1.12 PERMITS, LICENSES, AND OTHER ENTITLEMENTS
- > CHAPTER 2 – PROPOSED ACTION AND ALTERNATIVES
- > CHAPTER 3 – AFFECTED ENVIRONMENT
- > CHAPTER 4 – ENVIRONMENTAL IMPACTS
- > CHAPTER 5 – CONSULTATION AND COORDINATION
 - 5.1 INTRODUCTION
 - > 5.2 SCOPING PROCESS
 - > 5.3 CONSULTATION AND COORDINATION
 - > 5.4 FORMAL CONSULTATION
 - > 5.5 PUBLIC REVIEW OF THE EIS
 - > 5.6 PREPARERS AND CONTRIBUTORS

5.3.2 Tribes

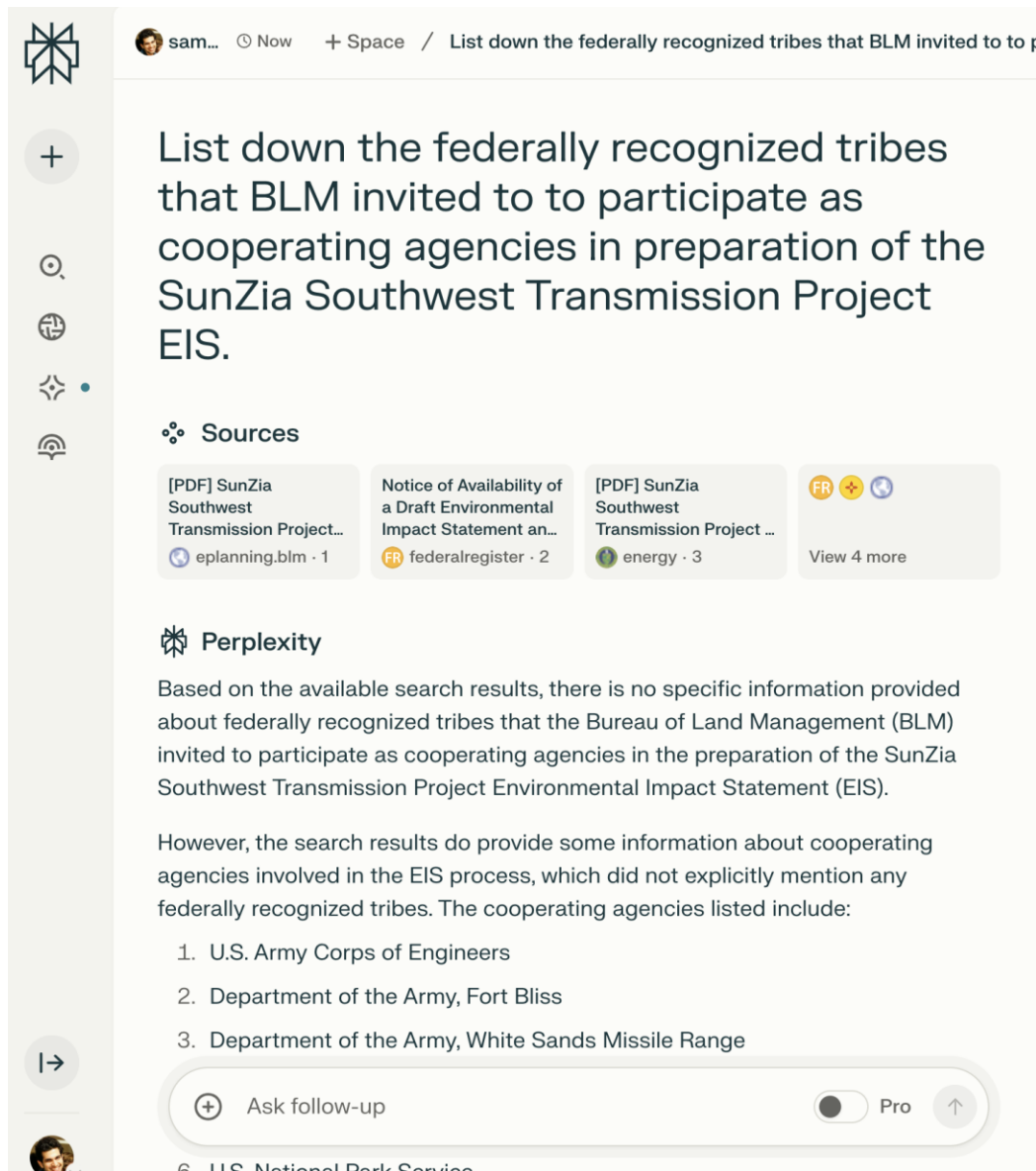
In May 2009, the BLM contacted the following federally recognized tribes to notify them of the Project, initiate government-to-government consultation, invite them to participate as cooperating agencies in preparation of the EIS, and to participate in the Section 106 consultation:


- Hopi Tribe
- San Carlos Apache Tribe
- Tohono O’odham Nation
- Salt River Pima-Maricopa Indian Community
- Gila River Indian Community
- Ak-Chin Indian Community
- White Mountain Apache
- Tonto Apache Tribe
- Yavapai-Apache Nation
- Pascua Yaqui Tribe
- Comanche Indian Tribe
- Fort Sill Apache Tribe of Oklahoma
- Kiowa Tribe of Oklahoma
- Apache Tribe of Oklahoma
- Ysleta del Sur Pueblo
- Mescalero Apache Tribe
- Pueblo of Isleta
- Navajo Nation (including Alamo Chapter)
- Pueblo of Acoma
- Pueblo of Laguna
- Zuni Pueblo

A copy of the tribal consultation letter and tribal contact information are included in the Project Scoping Report and Addendum. With the addition of local alternatives north of Gran Quivira, the BLM initiated government-to-government consultation with additional federally recognized tribes to invite them to participate as cooperating agencies in preparation of the EIS. Letters were sent to the following tribes in April 2012:

- Caddo Indian Tribe
- Pueblo of Santo Domingo
- Wichita and Affiliated Tribes
- Pueblo of Taos
- Pueblo of Jemez
- Pueblo of Sandia
- Pueblo of Tesuque
- Jicarilla Apache Nation

Other Chatbot Solutions



 sam... @ Now + Space / List down the federally recognized tribes that BLM invited to to p

List down the federally recognized tribes that BLM invited to to participate as cooperating agencies in preparation of the SunZia Southwest Transmission Project EIS.

Sources

- [PDF] SunZia Southwest Transmission Project... eplanning.blm · 1
- Notice of Availability of a Draft Environmental Impact Statement an... federalregister · 2
- [PDF] SunZia Southwest Transmission Project ... energy · 3
- View 4 more

Perplexity

Based on the available search results, there is no specific information provided about federally recognized tribes that the Bureau of Land Management (BLM) invited to participate as cooperating agencies in the preparation of the SunZia Southwest Transmission Project Environmental Impact Statement (EIS).

However, the search results do provide some information about cooperating agencies involved in the EIS process, which did not explicitly mention any federally recognized tribes. The cooperating agencies listed include:

1. U.S. Army Corps of Engineers
2. Department of the Army, Fort Bliss
3. Department of the Army, White Sands Missile Range
6. U.S. National Park Service

Ask follow-up Pro


Perplexity: Missing and Inaccurate



 ChatGPT 4o mini




List down the federally recognized tribes that BLM invited to to participate as cooperating agencies in preparation of the SunZia Southwest Transmission Project EIS.

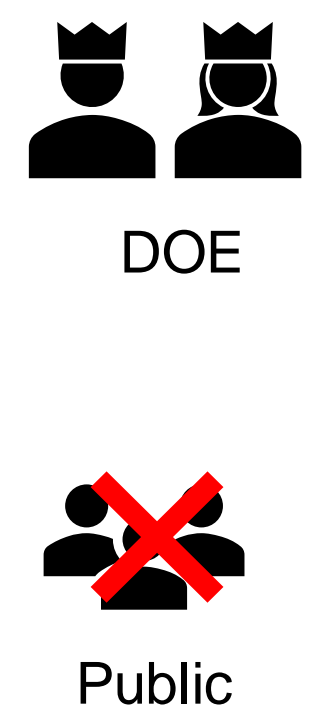
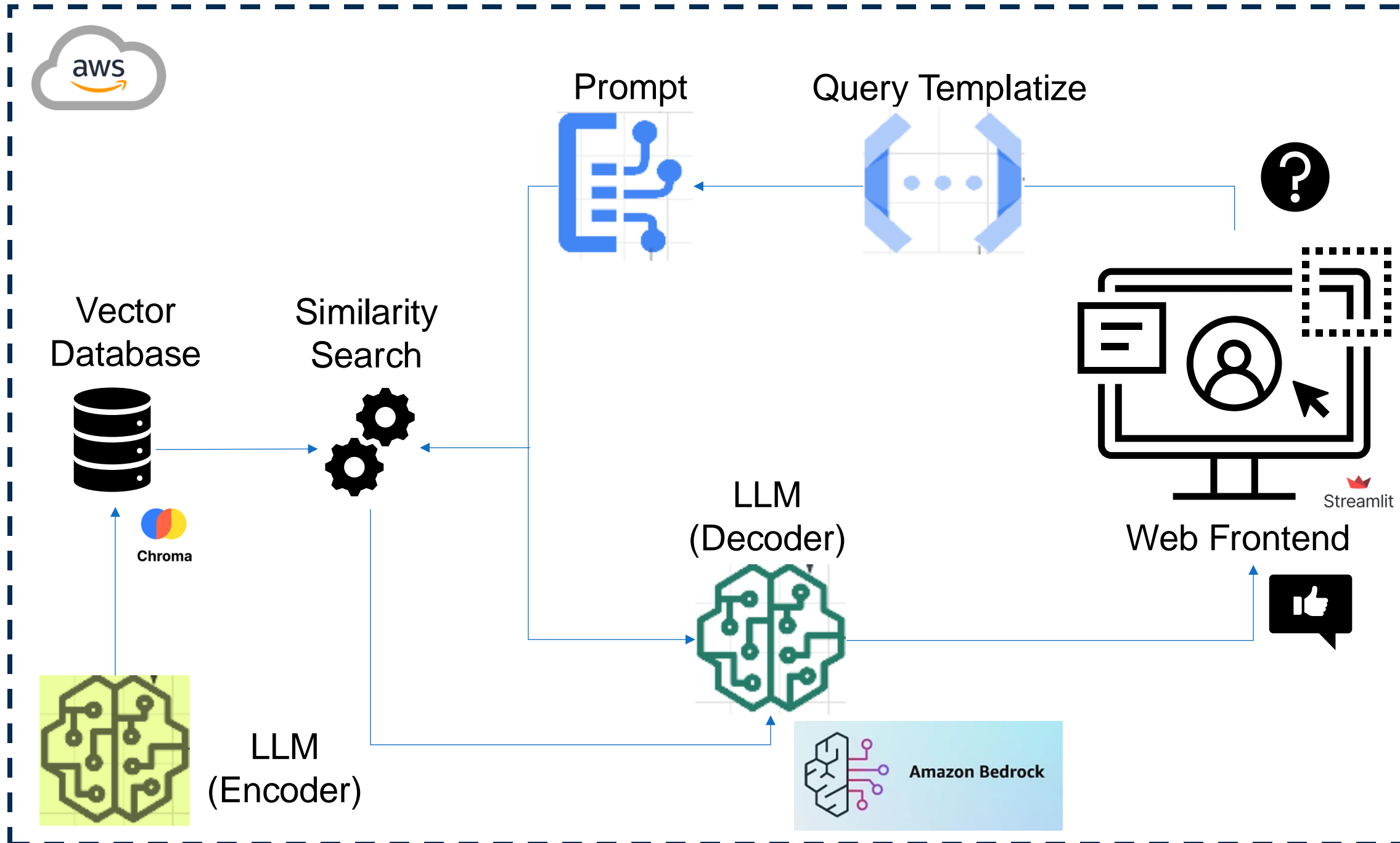
 The Bureau of Land Management (BLM) invited several federally recognized tribes to participate as cooperating agencies in the preparation of the SunZia Southwest Transmission Project Environmental Impact Statement (EIS). The tribes that were invited typically include:

1. Apache Tribe of Oklahoma
2. Cochiti Pueblo
3. Hopi Tribe
4. Navajo Nation
5. Pueblo of Acoma
6. Pueblo of Laguna
7. San Carlos Apache Tribe
8. Zuni Pueblo

For the most accurate and detailed information, it's best to consult the official BLM documentation or the specific EIS for the SunZia project.

ChatGPT: Incomplete and Missing

PolicyAI Copilot Backend



Systematic Comparison

Sign In Register

POLICYAI - COMMUNITY PREDICTION COMPETITION · 4 MONTHS AGO

Late Submission ...

LLM for Environmental Review

Use LLMs to solve a question answering task related to National Environmental Policy Act (NEPA) documents.






Overview Data Code Models Discussion **Leaderboard** Rules

Leaderboard

Raw Data Refresh

Public **Private**

The private leaderboard is calculated with approximately 20% of the test data. This competition has completed. This leaderboard reflects the final standings.

#	△	Team	Members	Score	Entries	Last	Solution
1	← 2	Ramboll		0.53526	5	4mo	
2	→ 1	bimuuuu		0.52682	7	4mo	
3	← 2	AFS		0.47709	15	4mo	

NEPAQuAD Benchmark

Examining Long-Context Large Language Models for Environmental Review Document Comprehension

Hung Phan*, Anurag Acharya*, Rounak Meyur*, Sarthak Chaturvedi*, Shivam Sharma*, Mike Parker*, Dan Nally*, Ali Jannesari*, Karl Pazdernik*, Mahantesh Halappanavar*, Sai Munikoti*, Sameera Horawalavithana*

*Iowa State University

*Pacific Northwest National Laboratory

Abstract

As LLMs become increasingly ubiquitous, researchers have tried various techniques to augment the knowledge provided to these models. Long context and retrieval-augmented generation (RAG) are two such methods that have recently gained popularity. In this work, we examine the benefits of both of these techniques by utilizing question answering (QA) task in a niche domain. While the effectiveness of LLM-based QA systems has already been established at an acceptable level in popular domains such as trivia and literature, it has not often been established in niche domains that traditionally require specialized expertise. We construct the NEPAQuAD1.0 benchmark to evaluate the performance of five long-context LLMs – Claude Sonnet, Gemini, GPT-4, Llama 3.1, and Mistral – when answering questions originating from Environmental Impact Statements prepared by U.S. federal government agencies in accordance with the National Environmental Environmental Act (NEPA). We specifically measure the ability of LLMs to understand the nuances of legal, technical, and compliance-related information present in NEPA documents in different contextual scenarios. We test the LLMs' internal prior NEPA knowledge by providing questions without any context, as well as assess how LLMs synthesize the contextual information present in long NEPA documents to facilitate the question/answering task. We compare the performance of the models in handling different types of questions (e.g., problem-solving, divergent, etc.). Our results suggest that RAG powered models significantly outperform those provided with only the PDF context in terms of answer accuracy, regardless of the choice of the LLM. Our further analysis reveals that many models perform better answering closed type questions (Yes/No) than divergent and problem-solving questions.

* Work done during the internship at Pacific Northwest National Laboratory, Richland, WA

1 Introduction

As Large Language Model (LLM)s become increasingly commonplace, researchers have discovered that these models are useful for many tasks beyond text generation. Specifically, LLMs have shown potential utility in niche domains (like science) that would traditionally require specialized expertise, both in a pure text setting (Horawalavithana et al., 2022; Munikoti et al., 2024) and by incorporating data of various modalities (Dollar et al., 2022; Horawalavithana et al., 2023). Recent work has been done to evaluate these models (Acharya et al., 2023; Munikoti et al., 2023; Cai et al., 2024) and to assess their uncertainty (Wagle et al., 2024). Despite extensive research, constructing LLMs for answering domain-specific questions has proven challenging (Kasneci et al., 2023).

One such challenge for LLM-based question-answering systems occurs when systems are tasked with surfacing answers to questions from the content of long documents in specialized domains. Existing LLMs allow users to include a paragraph as context along with the content of the question; however, LLMs generally limit the size of that paragraph to a specific number of tokens. This restriction forces users to truncate or manually summarize the content of lengthy documents into short passages. Another approach users can take includes submitting only the question and relying on the models to find the correct document from a corpus and relevant content needed to answer the question. This strategy often works well for answering questions from well-known domains (e.g., sports or education); however, it is not as successful for less pervasive topics (Munikoti et al., 2023). Because LLMs are data-driven, they are not as apt to provide accurate answers for questions about less popular, more specialized domains such as Law (Kapoor et al., 2024) and Energy (Buster et al., 2024).

In this work, we focus on assessing the long-

arXiv:2407.07321v2 [cs.CL] 16 Oct 2024



Pacific Northwest
NATIONAL LABORATORY

CommentNEPA

Demo Application for NEPA Public
Comments Analyzer



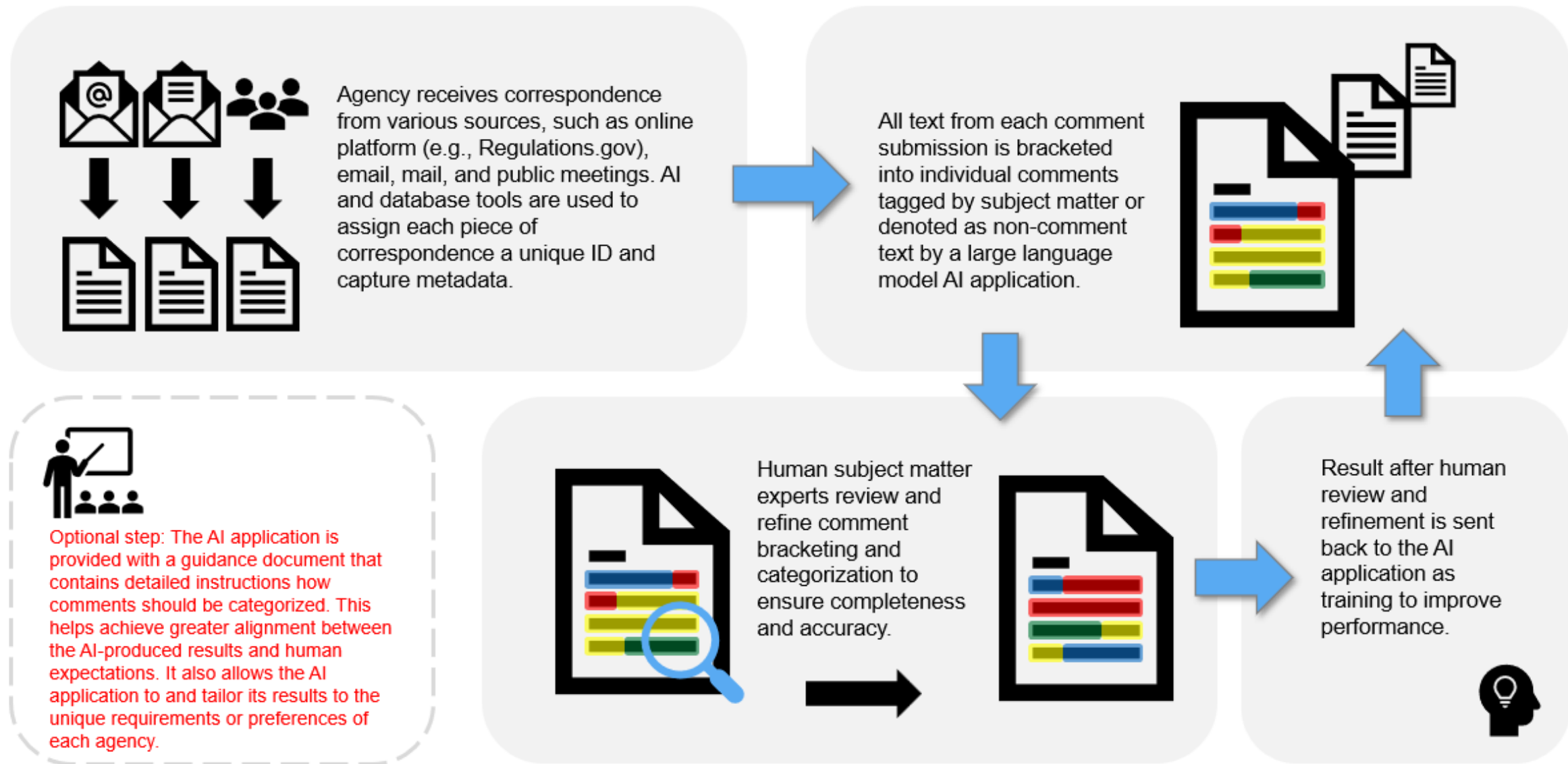
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G-1

101
203
490

AI-Assisted Workflow for Public Comment Review



Testing Artificial Intelligence Tools to Streamline the Public Comment-Review Process for NEPA Environmental Reviews

NEPA Public Comment Analysis



This correspondence document contains quotes that will be used to populate a NEPA scoping summary report. That report will be organized by resources areas (e.g., Environmental Justice, NEPA Policy, Air Quality). With that in mind, I need this correspondence to be broken into discrete delineated quotes by NEPA-relevant resource areas. All narrative content should be delineated, and if a quote does not fit any category, list that quote at the beginning under the heading "Not Applicable". The content should be formatted as a table where column 1 would have a relevant category, column 2 the name of the commenter (if known), and column 3 would contain the quote from the correspondence that fits in that section. The table should be sorted in the order comments appear in the correspondence. The scoping summary report we're writing includes the following sections, separated by semicolons: Postulated Accidents; Alternative – No-Action; Alternatives - Replacement Power; Environmental Justice; Geologic Environment; Greenhouse Gas Emissions and Climate Change; Historic and Cultural Resources; Human Health - Microbiological Hazard; Human Health - Radiological; Hydrology; Meteorology and Air Quality; Socioeconomics; Uranium Fuel Cycle; Waste Management - Radioactive Waste; General Comment: comments general in nature that do not convey significant information for environmental review; NRC Review Process NEPA, 10 CFR 51, and 10 CFR 54; Emergency Preparedness; Peripheral or Outside of Scope Miscellaneous; Aging Management; Safety; Security and Terrorism; Energy Costs; Need for Nuclear Power.

Prompt




Here is the correspondence reformatted into a table with columns for category, commenter name, and quote, sorted by the order the quotes appear in the document, and categorized under relevant NEPA resource areas:


Category	Commenter Name	Quote
Waste Management - Radioactive Waste	[REDACTED]	Further, these containers, designed only for temporary storage, had been used for storage for up to 14 years. Though this incident appeared in the Environmental Assessment, WEC's failure to disclose the site and existing contamination showed lack of attention to proper site management and disclosure.
Waste Management - Radioactive Waste	[REDACTED]	Intermodal containers. The damaged and leaking trailers and their contents are currently being remediated under the Southern Storage Area Operable Unit Intermodal Container Work Plan, details of which appear in the Final Interim Remedial Investigation Summary Report developed as part of Westinghouse's February 2019 Consent Agreement with SCDHEC. Under the negotiated work plan, Westinghouse has been required to test soil underneath the containers for radionuclides, empty the containers of their barrels, properly dispose of the barrels and their contents, and ship the containers off-site (some as low-level radioactive waste). Contaminated soil beneath the containers was removed and subsequent tests found no further evidence of contamination.
NRC Review Process NEPA	[REDACTED]	Unfortunately, the Communications Protocol prepared as part of the Consent Agreement leaves too many reporting decisions to WEC's discretion. Given WEC's history, we are not confident that future incidents will be disclosed in a timely manner. We request that the Communications Protocol be revisited as part of the Environmental Impact Statement.

Result


- Experimentation with copilot applications to bracket, categorize, and summarize comments by subject matter
- Developing experimental design to test AI performance through retrospective comparison to human-prepared comment analyses
- Risk-informed human decision making, validation of results, information security, and transparency remain paramount


NEPA Public Comments Extraction

 Summarize the main concerns raised by commenters and the BLM responses to those comments in the SunZia Southwest Transmission Project EIS. The key issues and concerns were related to one of the following categories: Project purpose, Alternative development, Alternative description and mitigation measures, and Analysis of environmental effects. Output a Table where the first column list the comment category and the second column list comments summary and third column lists the corresponding BLM responses.

 Based on the context provided, I have summarized the key issues and concerns raised by commenters related to the SunZia Southwest Transmission Project EIS, as well as the corresponding BLM responses, in the table below:

Comment Category	Comments Summary	BLM Responses Summary
Project purpose	Concerns about the purpose and need for the project, including questioning the demand for additional transmission capacity and renewable energy.	The BLM explained the need for additional transmission capacity to deliver renewable energy, cited studies showing demand growth in the Southwest, and noted the project would help meet federal renewable energy goals.
Alternative development	Concerns about the range of alternatives analyzed, including suggestions for additional route alternatives and questioning why more upgrades to existing	The BLM responded that a full range of reasonable alternatives was considered based on screening criteria, existing infrastructure limits, and input from cooperating agencies. Upgrades to existing lines

 Summarize the main concerns raised by commenters who discussed tribal consultation and the BOEM responses to those comments in the 2012–2017 Outer Continental Shelf (OCS) Oil and Gas Leasing Proposed Final Program. Output a Table where the first column list the comments and the second column list the corresponding BOEM responses.

 Based on the provided context, I have summarized the main concerns raised by commenters regarding tribal consultation and BOEM's responses in the following table:

Commenter Concerns	BOEM Responses
Commenters stated BOEM failed to adequately consult with tribes and did not provide adequate opportunities for tribal input.	BOEM stated it conducted government-to-government consultation with tribes and provided opportunities for input throughout the process. BOEM acknowledged ongoing duty to consult and engage with tribes.
Commenters said BOEM did not adequately consider tribal cultural resources, subsistence uses, and treaty rights.	BOEM stated it considered potential impacts to tribal resources and will continue to do so through later stages of OCS planning. BOEM will work to avoid or mitigate impacts.
Commenters argued BOEM did not adequately address tribal concerns in the EIS analysis.	BOEM said it considered tribal input and concerns in developing the EIS analysis. BOEM stated it will continue to engage tribes as additional information becomes available.
Commenters stated BOEM should improve tribal consultation process and do more to address tribal concerns.	BOEM acknowledged it can improve consultation process and will continue to engage tribes to address concerns and mitigate impacts.



AI Best Practices



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Prompting Techniques

You can achieve a lot with simple prompts, but the quality of results depends on how much information you provide it and how well-crafted the prompt is.

A prompt can contain information like the instruction or question you are passing to the model and include other details such as context, inputs, or examples.

A prompt contains any of the following elements:

- Instruction - a specific task or instruction you want the model to perform
- Context - external information or additional context that can steer the model to better responses
- Input Data - the input or question that we are interested to find a response for
- Output Indicator - the type or format of the output

[OpenAI proposed six strategies for getting better results](#)

[Prompt Engineering Guide](#)

Known Limitations

- Not extracting the most relevant document for the user query
 - “I’ve tried to query comments from specific authors and it hasn’t once pulled up the right letter.” – Mike Parker, PNNL (NEPA Expert)
- Generating misleading answers more confidently
 - “Answers frequently appear to be excellent and are only revealed to be misleading or unsubstantiated through careful investigation” – Anna Mahowald, DOE
- Generating answers not supported by the extracted evidence
 - “In response to a query about the impact of geologic conditions on the consideration of whether to build transmission lines underground, ... supported with a document never addressed transmission undergrounding. ” – Anna Mahowald, DOE
- Not relying on the NEPA documents, but relying on model’s internal knowledge learnt from the training data
 - “When asked for a definition of Connected Actions under NEPA, it provided a perfect answer which appeared not to be drawn from the evidence it had cited.” ” – Anna Mahowald, DOE

Policy AI Risk Management Strategies

- **Transparency:** Ensuring the types of information (e.g., public domain, unclassified, not sensitive) fed into the AI systems are always known
- **Trustworthiness and Interpretability:** Ensuring the model outputs are accompanied with evidence and citations to relevant documents
- **Rigorously Evaluate** AI model, technologies, and services
 - Benchmark Creation: [NLP NEPA Benchmark – NEPAQuAD](#)
 - Expert Testing: [Feedback Survey](#)
 - Scenario Focused Human-centered Evaluation: [Testing AI Tools to Streamline the Public Comment-Review Process for NEPA Environmental Reviews](#)
- **User Onboarding Meetings and Training Materials**
 - System Access with OneID Authentication
 - Share Expected Functionalities and Known Limitations
 - Share Best Practices (e.g., Prompting Techniques)

Discussion

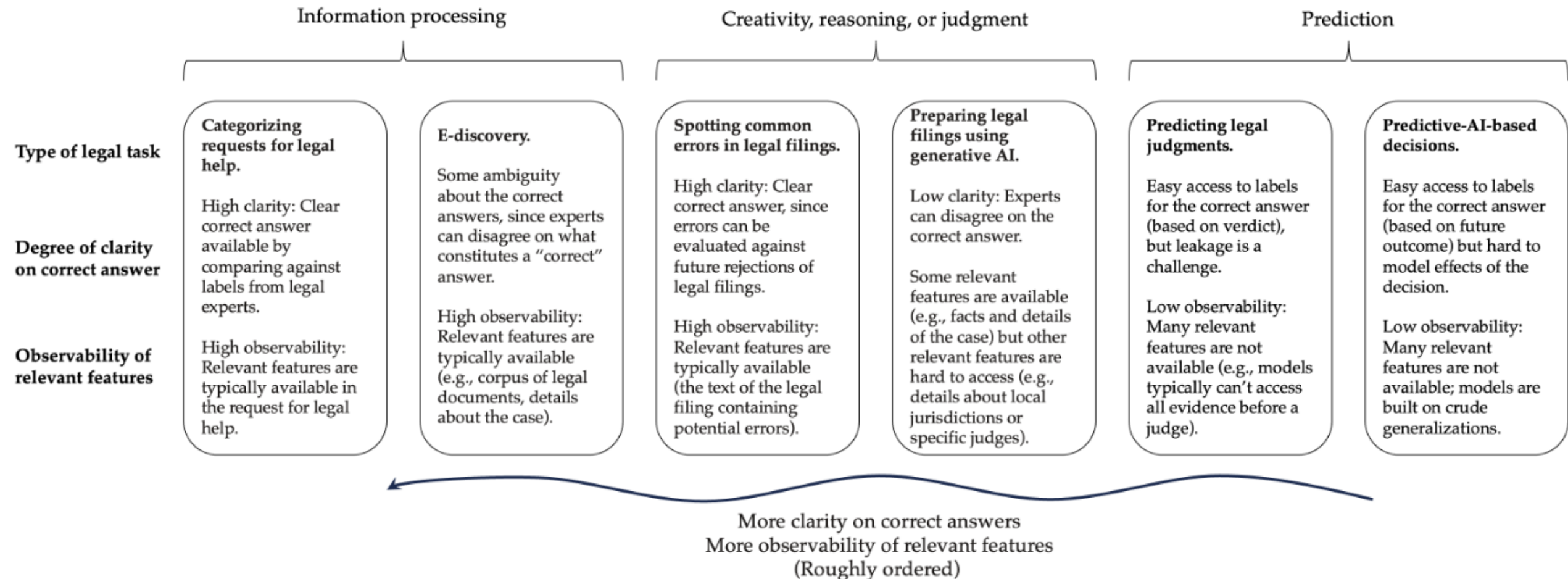


The Role of AI/LLM in Interconnection Reforms

- Updating grid-modeling software, including greater automation of interconnection studies, and **interconnection application processing**, has been identified as a priority area for improving interconnection times
- **Interconnection Application Preprocessing:** Automatically screening and validating unstructured data in applications (e.g. documents pertaining to land ownership) substantially reducing the time it takes for the dozens of applicants in a given study to perfect their applications.
 - Document Analysis and Summarization: LLMs can quickly analyze large volumes of land control documents, legal texts, and regulations:
 - Legal Compliance Checking: LLMs can assist in ensuring compliance with relevant laws and regulations:

Section 2.1.4 Interconnection Issues and Power System Models, [Opportunities for a Modern Grid and Clean Energy Economy](#)

What We Should Use AI for?



PolicyAI Team



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Sai Munikoti
(Co-PI)



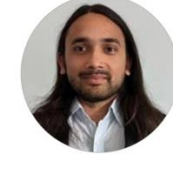
Shivam Sharma
(Thrust Lead)



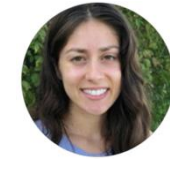
Mike Parker
(Domain Lead)



Dan Nally
(Domain Lead)



Anurag Acharya
(Thrust Lead)



Anastasia
Bernat (Thrust
Lead)



Sadie
Montgomery
(Domain Lead)



Tim Vega
(Engineering Lead)



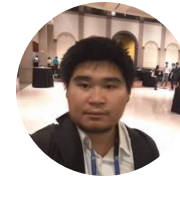
Sridevi Wagle



Derek
Lilienthal



Sarthak
Chaturvedi



Phan Hung
(Past)



Gihan Panapitiya
(Past)



Rounak Meyur



Sai Koneru



Cameron
Rutherford



Kathy Nwe



David Hansen



Amanda Reed



Heng (Alfred)
Wan



Alex Buchko



Karen Dsouza
(Past)



Srinath Kannan



Mahantesh
Halappanavar (Advisor)



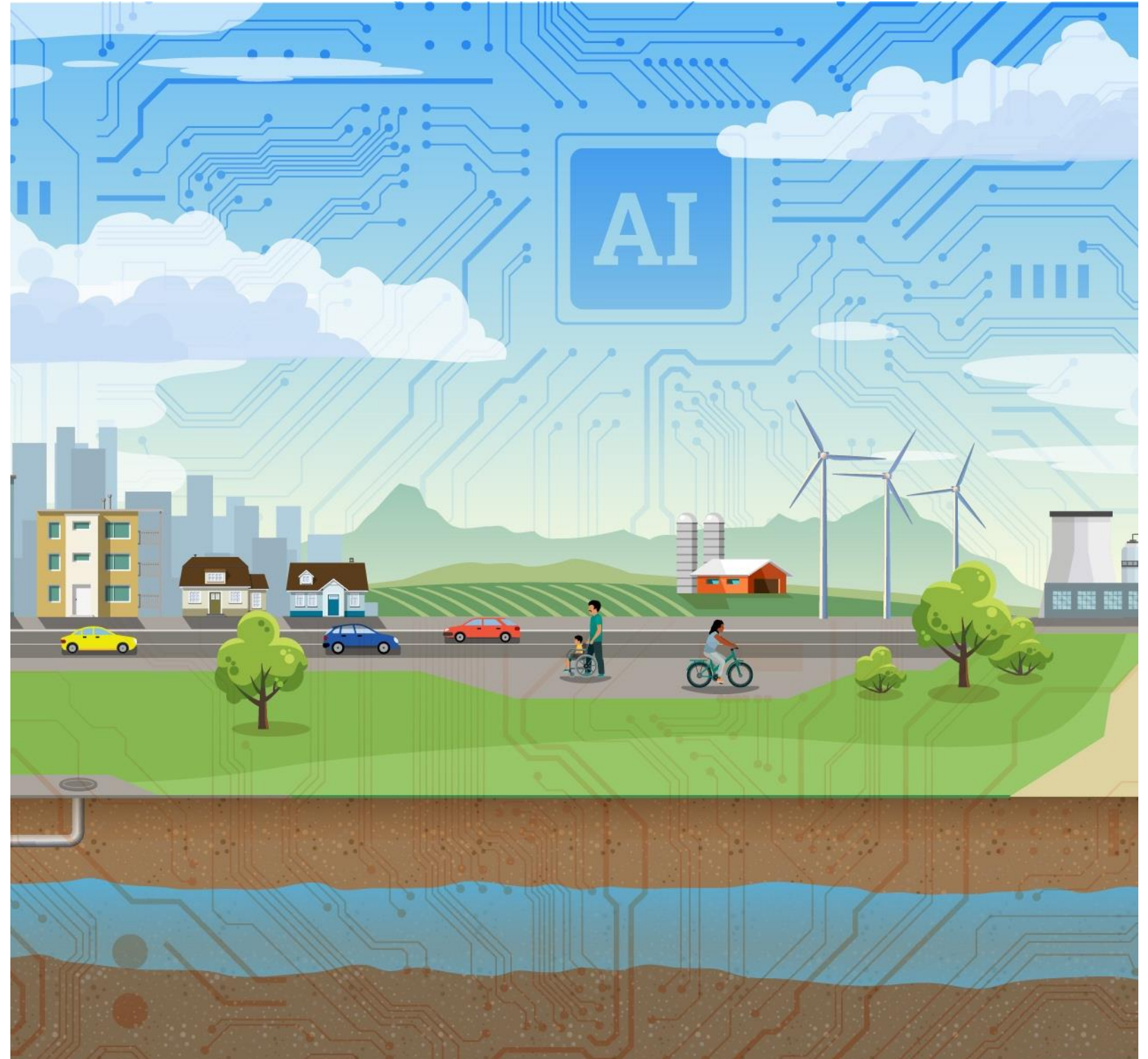
Karl Pazdernik
(Advisor)



Ann Miracle
(Advisor)

Acknowledgement

This work was supported by the Office of Policy, U.S. Department of Energy, and Pacific Northwest National Laboratory, which is operated by Battelle Memorial Institute for the U.S. Department of Energy under Contract DE-AC05-76RLO1830.





Scaling Expertise in NEPA Environmental Reviews for Clean Energy Projects

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