

Scaling Expertise in NEPA Environmental Reviews for Clean Energy Projects

Sameera Horawalavithana, Ph.D. Data Scientist



PNNL is operated by Battelle for the U.S. Department of Energy

PNNL-SA-205144



EPRI's 43rd Annual Seminar on Resource Planning for Electric Power Systems, October 29-30, 2024, Washington, D.C



Outline

490

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





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 humancentered 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.

U.S. Department of Education, Office of Educational Technology, Artificial Intelligence and Future of Teaching and Learning: Insights and Recommendations, Washington, DC, 2023.



490

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.

ENERGY Office of Policy

Queued Up... **But in Need** of Transmission

Unleashing the Benefit of Clean **Power with Grid** Infrastructure

T enation needs transmission infrastructure to unlock the enormous benef ts and opportunities that the dean energy transition presents from spurring economic growth, to revitalizing domestic manufacturing, to creating millions of good jobs for American workers. Moreover, studies of en f nd that the benef ts of transmission exceed the costs. by enabling access to low-cost generation, helping to maintain reliability and avoid power outages, and supporting dean energy supply.

Yet, a large amount of potential dean 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 posebarriers, both for generator interconnection and regional and inter-regional grid infrætructure.

T eBipartisan Infrastructure Law contains important economic programs and authorities to help kick-start transmission investments. T eproposed dimate and dean 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

benef ts of new transmission. An all-ofgovernment and all-of-society approach iscrucial to fully realize the benef ts of a modernized grid and move the nation forward to a more secure and equitable dean energy future for all Americans.

Queued-Up

T etotal amount of new electric generation capacity needed to meet ambitious 2030 dean 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 T is 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 electrif cation, consistent with the nation's decarbonization commitments.

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% dean electricity scenario for 2030 estimates the need for -950 G/V of new dean power capacity and -225 G/V of storage (A bhyankar et al. 2021. "2030 Report: Rowering America's Clean Economy." UC Berkeley, Coldman School of Rublic Policy.). A separate study from the U.S. Department of Energy assesses a scenario that reaches ~70% dean by 2030, envisioning ~510 GW of additional dean 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% dean electricity share by 2035, it requires 1,880-1,800 GW of new dean power capacity by 2035 as well as 130-150 GW of batter y storage (United States Executive Office of the Resident. 2021. "The Long-Term Strategy of the United States: Pathways to Net-Zero Greenhouse Gas Emissions by 2050." Washington, D.C.).



Energy Markets & Policy BERKELEYIAR

> Publications **Research Areas** Tools & Data Webinars

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

Source https://emp.lbl.gov/news/grid-connection-backlog-grows-30-2023-dominated-requests-solar-wind-and-energy-storage

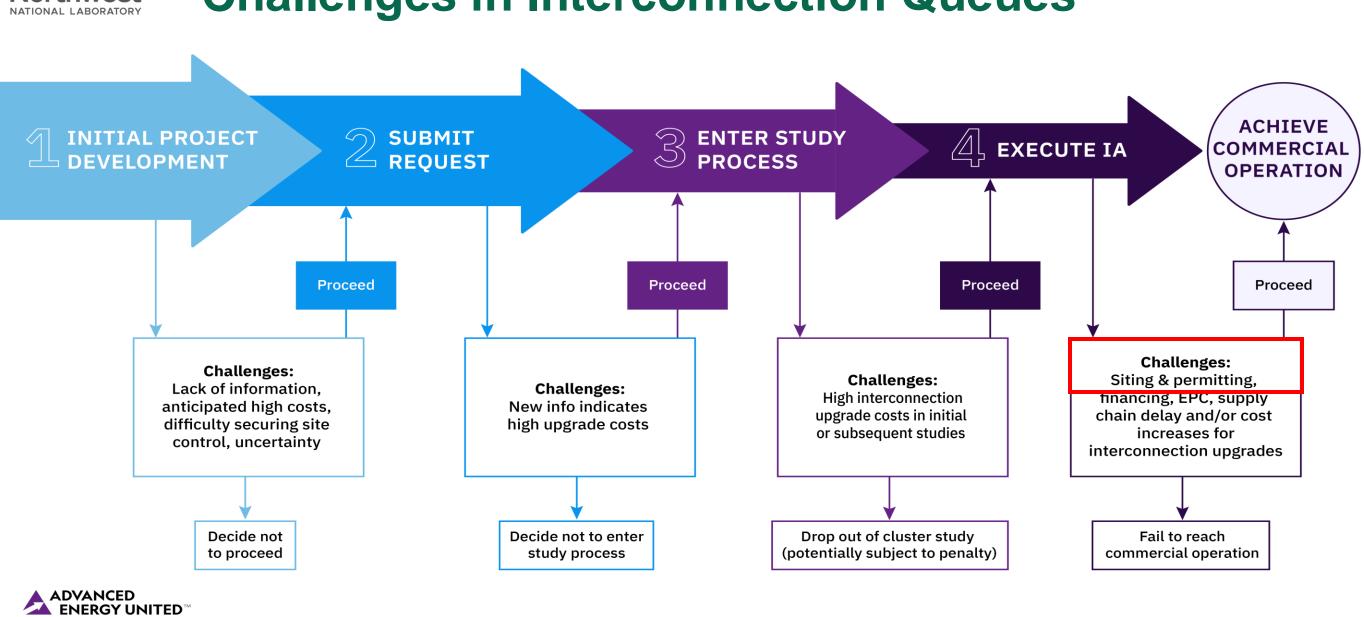


About Us

Q



Challenges in Interconnection Queues



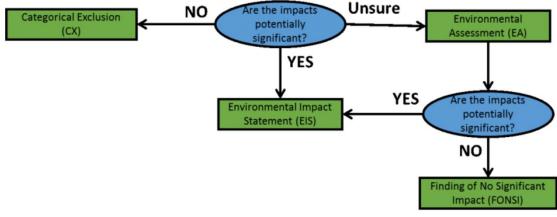
Source https://blog.advancedenergyunited.org/interconnection_explainer



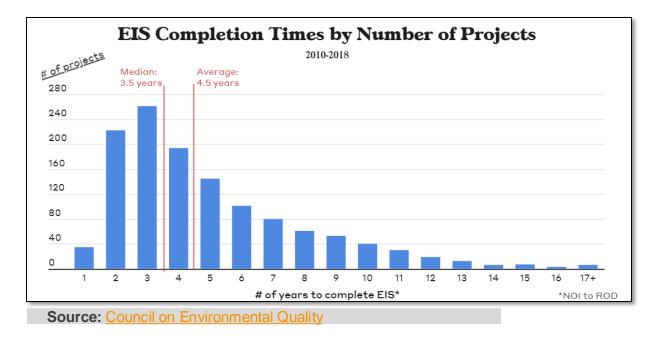
490

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 ٠ 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



Slides Attribution to Keith Benes, DOE

6



Recent Environmental Reviews



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 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

U.S. DEPARTMENT OF ENERGY

THE NATIONAL LABORATORIES

The U.S. Department of Energy (DOE) <u>has</u> <u>announced many actions</u> 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.

ENI	ERGY
	Al for Energy Opportunities for a Modern Grid and Clean Energy Economy
	April 2024

DOE 2024

4

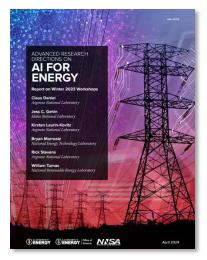
PORT

5

TOOL



https://www.energy.gov...



DOE 2024





https://www.pnnl.gov...

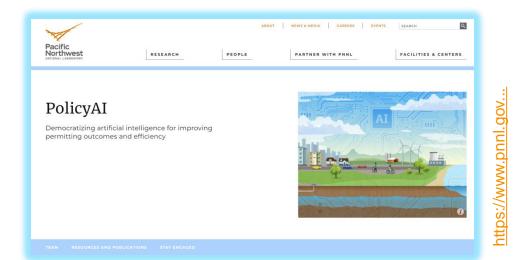
September 17, 2024



203

490

PolicyAl Overview



Timeline

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

1–2 years

Al-enabled pilots improving permitting workflows

5 years

Operationalized AI models streamlining permitting

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

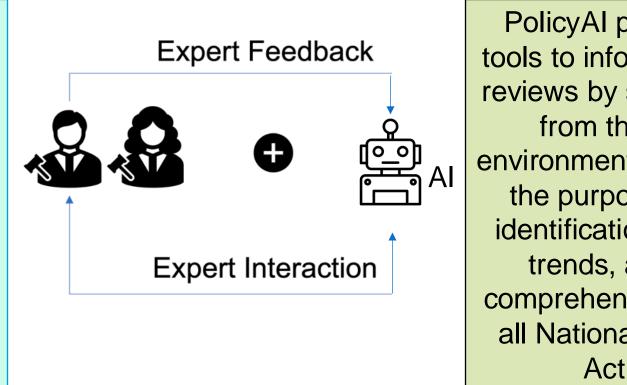


AI-Driven Environmental Review and Permitting

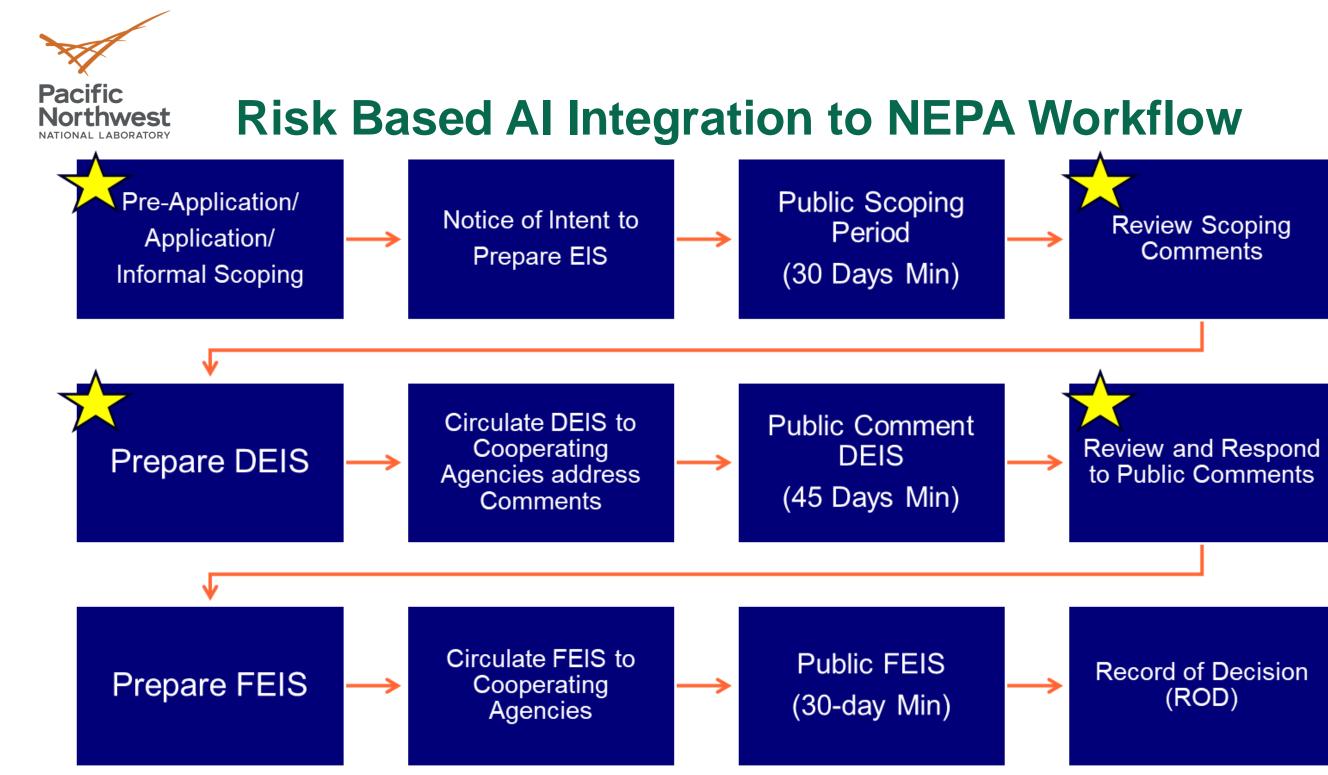
Critical Opportunity

Environment and permitting process is tedious, expensive and time taking. Al 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.



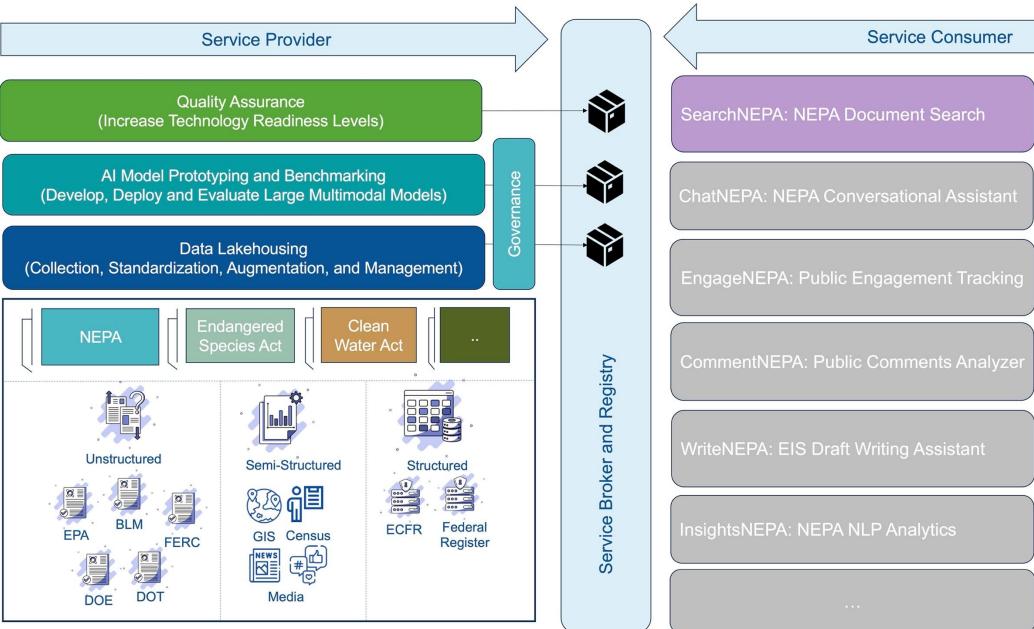
PolicyAl project is developing Al tools to inform future environmental reviews by synthesizing information from thousands of existing environmental review documents for the purpose of efficiency gains, identification of otherwise unseen trends, and the creation of a comprehensive map and catalog of all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



Slides Attribution to Keith Benes, DOE



PolicyAl Service Oriented Architecture







490

Rich Multimodal PDFs

TABLE OF CONTENTS

4 Proposed Action....

No Action Altern

2.2.1.1 Train Transport 2.2.1.2 Truck Transport

Action Alternatives

2.2.2.1 Train Transport ... 2.2.2.2 Truck Transport .

2.4.3 Cumulative Impacts.

Site Infrastr

3.1.1.2 Water 3.1.1.3 Electricity... 3.1.1.4 Natural Gas 3.1.1.5 Steam......

Water

2.5 Preferred Alterna AFFECTED ENVIRONMEN

COVER SHEET

RESPONSIBLE FEDERAL AGENCY: U.S. Department of Energy (DOE)

- TITLE: Final Supplemental Environmental Impact Statement for Disposition of Deplete Uranium Oxide Conversion Product Generated from DOE's Inventory of Depleted Uraniu Hexafluoride (DU Oxide SEIS)
- LOCATIONS: Kentucky, Nevada, Ohio, Texas, and Utah
- CONTACT: For further information on this supplemental environmental impact stateme

Jaffet Ferrer-Torre

Document Manager

Office of Enviror U.S. Department of Energy 1000 Independence Avenue, S.W. Washington, D.C. 20585 Telephone: 202-586-0730 email: DUF6_NEPA@em.doe.gov

For general information on the DOE National Environmental Policy Act (NEPA) process, contact

William Ostrum EM NEPA Compliance Officer Office of Environmental Management, EM 4.31 U.S. Department of Energy 1000 Independence Avenue, SW Washington, DC 2058S Telephone: 202-586-2513

This document is available on the DOE NEPA website (http://enerand the Portsmouth/Paducah Project Office website (https://www.energy.gov/em/dispuranium-oxide-conversion-depleted-uranium-hexafluoride) for viewing and downloading.

ABSTRACT:

On June 18, 2004, the U.S. Department of Energy OOK) is used environmental impact subsenses for the constraint of the environment of the environmental interact subsenses for depicted straining (DU) code a DOFs Pahchas Site (Pahcash) in Kenneky and Perturnold Site (Perturnold) is 006/006 (PA) (DA). Both the Final Environmental Impact Subsenses for Construction and Operation of a Depicted Uranim Heartflowide Conversion Facility at the Pahcack. Kenneky Site (ODEELSSOS) and the Final Environmental Impact Summent for Pahcack. Kenneky Site (ODEELSSOS) and the Final Environmental Impact Summent for Site (Patcash). Construction and Operation of a Depleted Uranium Hexafluoride Conversion Facility at the

Metadata

There are also 205, 55-gallon (208-liter) steel drums of DU oxide stored at Po

s many as five drams could be generated at each co

ads; only empty and heel

Figure 2-5 DUF, Cylinder Storage Yard (Source: BWXT 2016b ed in 55-gallon (208-liter) drums is protected from the elements by str

ws the location of the storage yards at Paducah. There a total of approximately 3.6 million square feet (334

rage space. This is enough space to store nearly 77,000 7,000 to 470,400 square feet (1 570 to 42 707

ration allows access for routine inspections and

t this DU Oxide SEIS to evaluate alterna 2.1.3 Container Storag



DESCRIPTION AND COMPARISON OF ALTERNATIVES

2.1 DESCRIPTION OF RELATED ACTIVITIES AT PADUCAH AND PORTSMOUTH

taoxide (U3Os). The U3Os form is the most stable for sand in nature. Unreference with her y 2.7 grams per cubic cen aditions (PPRO 2018)

ht-percent uranium-235. Most of DOE's DU inventor anium-235 (ANL 2016a). The DU oxide at Paduca

ronmental impacts of transportation

Maps

Images

Sale and Offsite Transport of HF Transport of CaF, for Disposal Transport of Empty Cylinders for Disposa Transport of DU Oxide for Disposal 2.1.2 Quantities of Depleted Uranium Oxide to be Manage

Prior to the start of conversion operations, there were approximately 56 (617,288 tons) of DUF6 stored in 46,000 cylinders at Paducah and approximate tored in 21,000 cylinders at Portsmou d from ETTP). By February 2018, the

Figures/Plots

1 INTRODUCTION AND PURPOSE AND NEED FOR AGENCY ACTION

1.1 BACKGROUND INFORMATION

The use of unraining a fuel for matter reactors or for military applications requires uranium enrichment; that is, increasing the proportion of the fusile uranium. Tables states and the state of a dama bonds uranium. Industrial uranium cercichment in the United States begans as part of atomic bonds continued by the U.S. Aromic Energy Commission and its successor agencies; including the U.S. Department of Energy (DOE). Uranium enrichment by gascos diffusion was carried out at three locations now known as the Paducah Site (Paducah) in Kentucky, the Portsmonth Site (Portsmonth) in Ohio, and the Ester Tennessee Technology Pat (ETTP) in Oak Redge. Tennesse: These sites: Pates Land Portsconth USEC/D conducted enrichment operations at two of and is now Centure Berrey Comparison. USEC heat and the section of the site o and is now Centrus Energy Corporation.

Depleted uranium hexafluoride (DUE₄)¹ results from the uranium enrichment process. The DUE Depicted uranium hexafluoride (DUFs)¹ results from the uranium enrichment process. The DUFs that remains after enrichment is stored in large steel cylinders that cash comma providently 9 The DUFs, storage cylinders were initially storad af Paheach Pertonneth, and ETTP when heav over generated. However, all DUFs, cylinders that were stored at ETTP were transported to Portsmoth. At its peak, Paheach stored approximately 46:000 DUFs, cylinders (500,000 metric tions (617,000 0ms), and Portmonth approximately 46:000 DUFs, cylinders (500,000 metric tions (617,000 0ms), and Portmonth approximately 46:000 DUFs, cylinders (500,000 metric 276,000 metric unas) for a total of about 67,000 cylinders (800,000 metric unas (276,000 metric unas) and extremedual paperimetely of concents storage area instru-ors "arubs."

In addition to the DUFs cylinders, there are cylinders that contain enriched UFs or normal UFs are empty or mostly empty (collectively called "non-DUF6" cylinders). The Final Environment Impact Statement for Construction and Operation of Depleted Uranium Hexafluoride Conversite Facility at the Paducah, Kentucky, Site (DOE/EIS-0359) (Paducah EIS), and Final Environment. Impact Statement for Construction and Operation of Depleted Uranium Hexafluoride Conversio Facility at the Portsmouth, Ohio, Site (DOE/EIS-0360) (Portsmouth EIS) (DOE 2004a, 2004) relations with the "ADME Bic," with a sum of DAP to here and the set of the DAP to here any set of the "DDME Bic," with a sum of DAP to here any set of the contents of the Dap to here any set of the contents of the non-DUFs, of linkers was not considered at that time and are not considered in this Final Symphometal Environmental Impact Statement for Dapparticities of DapPated Tarahaman Parks and Statement (SAB at Palacaka and SSAT) and Stat

, not a waste, cylinders have had the DUF₆ and heel material removed and contain limited residual material. Heel constain annowimately 50 lb (23 kg) of residual nonvolatile material left after the DUF₆ has been re

Text





nspections for most of the c

h rates shown in Table 2-1 were used to calculate th I be breached under the various corrosion scenario ad in this DU Oxide SEIS. The results of these esti

Tables

Tables



Sections

 A Proposed Action
 Subble Involvement
 Soupe of this Supplemental Environmental Im
 I.6.1 Human Health and Safety.
 I.6.2 Transportation.
 I.6.3 Disposal of Depleted Uranium Oxide and
 7 Changes from the Draft DU Oxide SELS. Changes from the Draft DU Oxide SEL
 Relationship to Other NEPA Reviews.
 Organization of this Supplemental Env

1 INTRODUCTION AND PURPOSE AND NEED FOR AGENCY ACTION......1-

Background Information
 Changes Since the Paducah and Portsmouth EIS's were Prepared in 2004
 Purpose and Need for Agency Action

DESCRIPTION AND COMPARISON OF ALTERNATIVES ... Description of Related Activities at Paducah and Portsmouth... 1.1 DUFs, Processing and Cylinder Movement 1.2 Quantities of Depleted Uranium Oxide to be Managed... 1.3 Container Storage 2.2.2 Truck Transport
 2.3 Alternative Scalarder blas Not Analyzed in Detail
 3 Alternative Scalarder blas Not Analyzed in Detail
 3.5 On Site Disposal of DU Oxide
 3.3 Desposal of Wastes at Other LLW Deposal Facilities
 3.3 Desposal of Wastes at the Waste Isolation Pilot Plant
 2.4 Comparison of Alternative
 4.1 General Information
 4.2 Summary and Comparison Of Detential Environmental Impacts of the

¹Depleted uranium is uranium that, through the enrichment process, has been stripped of a portion of the uranium 235 that is once contained so that its proportion is lower than the 0.707 weight-percent found in nature. The uran is most of DOE's DUF, has between 0.2 and 0.4 weight-percent trainim-235. DUF's is considered a source

 at http://www.chillicothegazette.com/story/news/local/2016/02/19/centrifuge-plan shut-down/80629116/ (accessed February 15, 2018). Balusik, C. 2017, "American Centrifuge Still Part of Piketon Site Discussions," Chillicothe Gazette, September 29, on at bitc/itweit/bit

6 REFERENCES

http://ww 1, 2016).

Baptist Health Paducah 2016, "Welcome to Baptist Health Paducah," at

ANL (Argonne National Laboratory) 2016a, "Depleted" Uranium at

https://www.atabusinesssolu

Final Supplemental Environmental Impact Statement - Depleted Uranium Oxid

Adena 2016. "Adena Pike Medical Center: Comprehensive Care and Services." at

Citations

http://web.evs.anl.gov/uranium/guide/depletedu/index.cfm (accessed August 19, 2016

ANL (Argonne National Laboratory) 2016b, "Where Depleted UFs is Stored in the United States," at <u>https://web.evs.anl.gov/uranium/mgmtuses/storage/index.cfm</u> (accessed August 19, 2016).

Balusik, C. 2016, "American Centrifuge Plant will Shut Down," Chillicothe Gazette, Februar

ATA (American trucking Association) 2018, "American Trucking Trends 2017,"

Paducah Portsmouth
No Action Disposal No Action Disposal Activity Alternative Alternatives I in the 2004 EISs (DOE 2004a, 2004b) but not in this DU Oxide SEIS (2004) and a contract of the contract of

posal of Waste at EnergySolutions sposal at EnergySolutions near Clive, Utah, was evaluated in the 2004 EISs. At that time, the me of the site was Envirocare of Utah, Inc. This site is 5 miles (8 kilometers) south of the Clive

Short Form Medium Form Wide and Long Form Tables

Annual criteria pollutant emissions were calculated based on estimated shipments from each facility to NNSS (see Table 4-35). Analysis estimated approximately 2,000 miles (3,300

Truck Option

direct rail access to NNSS, thipments via train would travel to Barstow, California, where they would b nately 200 miles (330 kilometers) from Barstow to the NNSS facility. The "Grand Total" emissions ar

	Mode of		Criteria Pollutant Emissions (tens/year)					
Material	Transport	Site	CO	NOs	PMie	PMaa	SO.	VOC
		Paducah	0.02	0.05	0.00	0.00	0.00	0.00
	Truck	Poetsmouth	0.01	0.03	0.00	0.00	0.00	0.00
Ancillary LLW		Total emissions	0.03	0.68	0.00	0.09	0.60	0.01
ind MLLW		Paducah	0.09	0.34	0.01	0.01	0.01	0.02
	Train	Poetsmouth	0.11	0.41	0.01	0.01	0.01	0.02
		Total emissions	0.19	0.75	0.03	0.03	0.01	0.04
		Paducah	0.69	1.96	0.07	0.07	0.00	0.20
	Truck	Poetsmouth	0.69	1.96	0.07	0.07	0.00	0.20
DU oxide in		Total emissions	1.37	3.92	0.14	0.13	0.01	0.41
cylinders		Paducah	2.11	8.17	0.30	0.29	0.15	0.45
	Train	Poetsmouth	2.54	9.81	0.36	0.35	0.18	0.54
		Total emissions	4.65	17.98	0.65	0.63	0.33	0.99
		Paducah	0.06	0.17	0.01	0.01	0.00	0.02
	Truck	Poetsmouth	0.06	0.17	0.01	0.01	0.00	0.02
14,000 empty		Total emissions	0.12	0.34	0.01	0.01	0.60	0.04
and heel cylinders	Train	Paducah	0.35	1.36	0.05	0.05	0.02	0.08
cylinders		Poetsmouth	0.42	1.63	0.05	0.05	0.03	0.09
		Total emissions	0.77	3.60	0.11	0.11	0.05	0.17
	Truck	Paducah	0.29	0.82	0.03	0.03	0.00	0.09
		Poetsmouth	0.20	0.56	0.02	0.02	0.00	0.06
DIL oxide in		Total emissions	0.48	1.38	0.05	0.05	0.00	0.14
bulk bass	Train	Paducah	1.32	5.11	0.19	0.18	0.09	0.28
		Poetsmouth	1.06	4.09	0.15	0.14	0.07	0.23
		Testal emissions	2.38	9.79	033	0.32	017	0.51
	Truck	Paducah	0.32	0.92	0.03	0.03	0.00	0.10
		Portsmouth	0.25	0.71	0.03	0.02	0.00	0.07
99,000 empty		Total emissions	0.57	1.63	0.05	0.05	0.60	0.17
and heel		Paducah	2.02	7.83	0.28	0.28	0.14	0.43
cylinders	Train	Portsmonth	1.80	6.95	0.25	0.24	0.13	0.38
		Total emissions	3.82	14.78	0.54	0.52	0.27	0.87
		Paducah	0.45	1.30	0.05	0.04	0.00	0.14
	Truck	Portsmonth	0.29	0.84	0.03	0.03	0.00	0.09
		Total emissions	0.75	2.13	0.05	0.07	0.00	0.07
CaF ₂		Paducah	2.11	8.17	0.30	0.29	0.15	0.45
	Train	Portsmonth	1.58	613	0.22	0.22	0.11	0.34
		Total emissions	3 20	14.30	0.52	0.50	0.11	0.79
Grand Tat	al (DU Oxide i		7.45	28.82	1.05	1.02	0.53	1.59
		n Bulk Bags)	8.69	33.61	1.22	1.02	0.61	1.86

Table 4-34 Criteria Pollutant Emissions from Transportation via Train to Barstow California, and Truck to NNSS*

ANL (Argonne National Laboratory) 2004b, Wetland Assessment of the Effects of Construction and Operation of a Depleted Uranium Headfloordde Conversion Facility at the Portsmouth, Ohio, Site, ANL-Vol 59, April prepared for the U.S. Department of Energy, Oak Ridge Operations Office, at https://digital.library.umt.edu/ark-(6751)/metadc794713 (accessed September 26, 2018).

luctId/3997327

ANL (Argonne National Laboratory) 2004a, Floodplain/Wetland Assessment of the Effects of Argome roatomat Laboratory 2008a, Piologiani ne elima Assessmenti oj inte Ejecso oj Construcciton and Operation of a Depieted Uranium Heardhorich Conversion Facility and the Paducch, Kentucky, Site, ANL-04/37, April, prepared for the U.S. Department of Energy, Oak Ridge Operations Office, at https://publications.anl.gov/anlpubs/2005/09/54408.pdf (accessed September 26, 2018).

ANL (Argome National Laboratory) 2001, Transportino Impact Accounter for Shipmert of Commun. Headparted (1976). Children from the East Transactor Totshochy Director for Commun. Lin. Product Officiary in Difficient Part East Transactors Totshochy and the Montte, L., N. Poster, and N. E., Rance, A. M. E.A.D.T. 12, Environmental Assessment Division, Argome, Illinois, prepared for U.S. Department of Energy, Office of Environment Management, Ods Reide Operations Office, Oxtober.

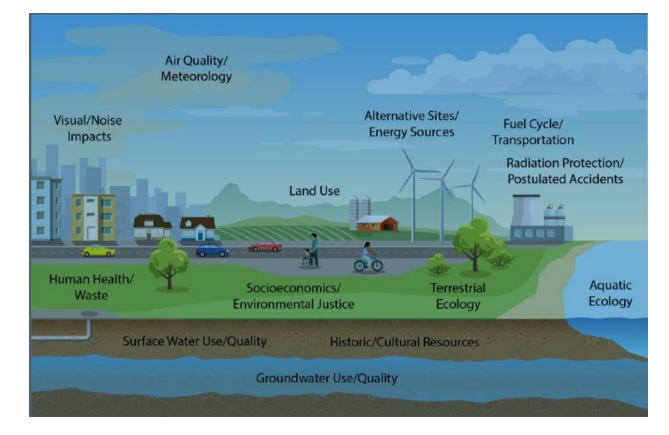
v.adena.org/locations/detail.dT/Adena-Pike-Medical-Center (accessed Augus

13



Anatomy of a NEPA Document

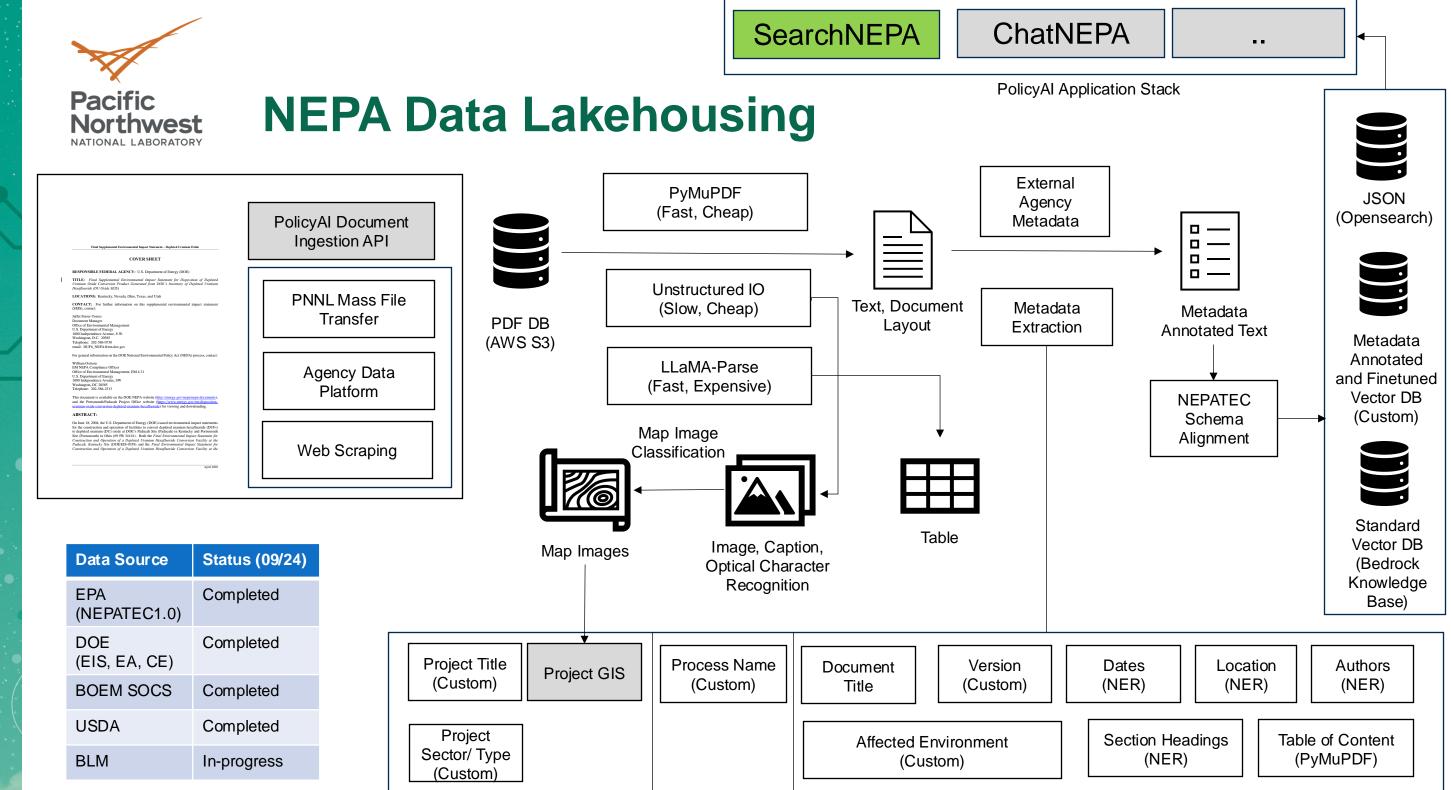
- 1. Purpose and Need/Proposed Action Description
- 2. Affected Environment Baseline conditions
 - a. Land Use/Visual/Transportation
 - b. Geology/Soils
 - c. Hydrology (groundwater/surface water)
 - d. Ecology (terrestrial/aquatic)
 - e. Air Quality/Meteorology/Climate Change
 - f. Historic & Cultural 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



Ann Miracle

10/28/2024





(NEPATEC1.0)	Completed
DOE (EIS, EA, CE)	Completed
BOEM SOCS	Completed
USDA	Completed
BLM	In-progress

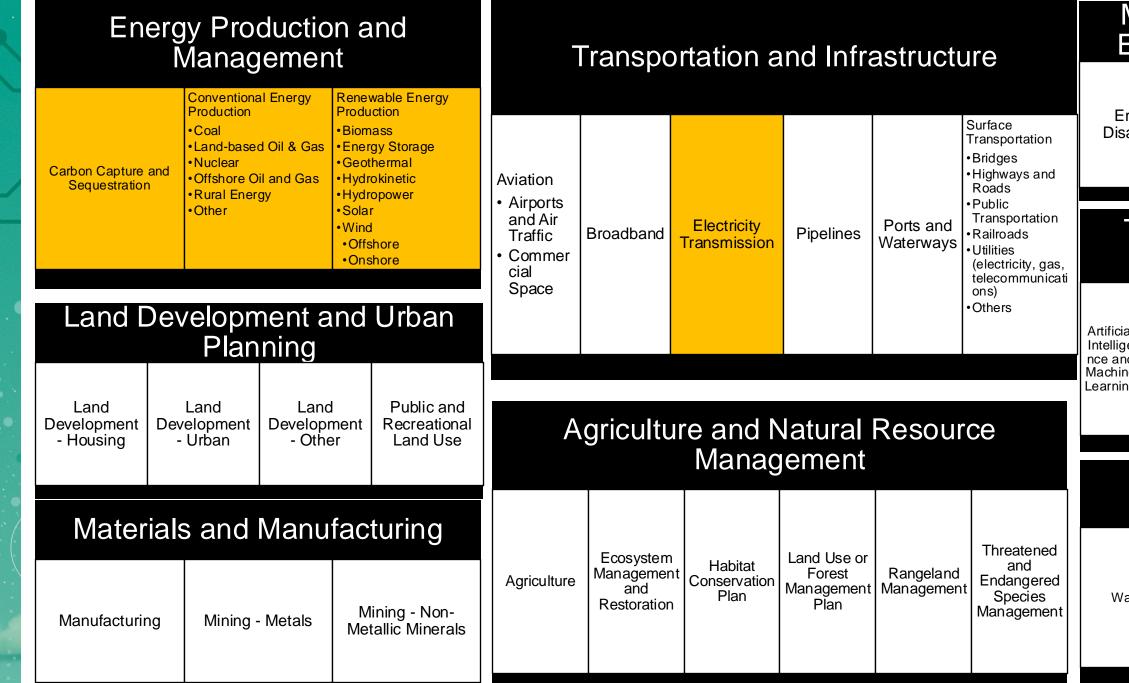
*Gray color boxes highlight work in progress components

Project Metadata



490

NEPA Text Corpus (NEPATEC) – Project Sector



Military, Defense, and Emergency Response

Emergency and Disaster Response

Military and Defense

Technology and Data Management

ial nd ne ng	Cyberse curity	Data Storage and Data Manage ment	Perform ance Computi ng and Advance d Comput er Hardwar e and Softwar	Quantu m Informati on Science and Technol ogy	Semicon ductors	
-----------------------	-------------------	--	---	--	--------------------	--

Water and Waste Management

Waste Management

Water Resources

Irrigation and Water SupplyOther



Production Application for NEPA Document Search



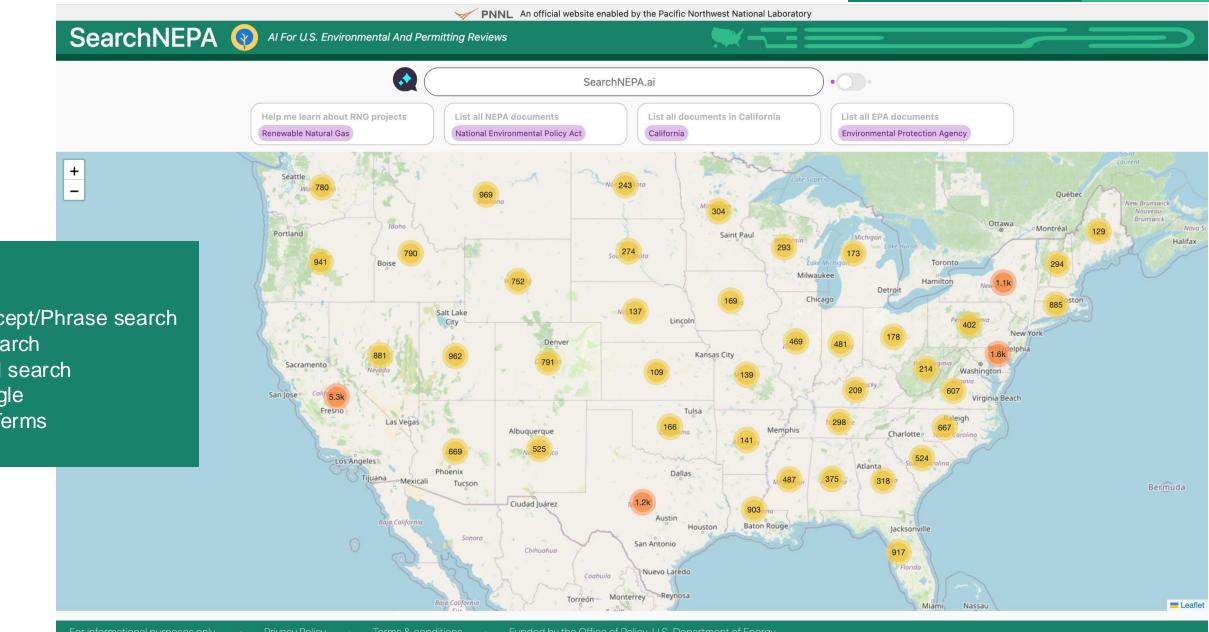
PNNL is operated by Battelle for the U.S. Department of Energy





Standard Document Full Text Search

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



Features

490

- Search Bar with
 - Keyword/Concept/Phrase search
 - Compound search
 - Prompt GenAl search
- GenAI ON/OFF Toggle ۲
- Suggested Search Terms
- Document map

Home

Pacific

Features

•

۰

metadata for

203

490

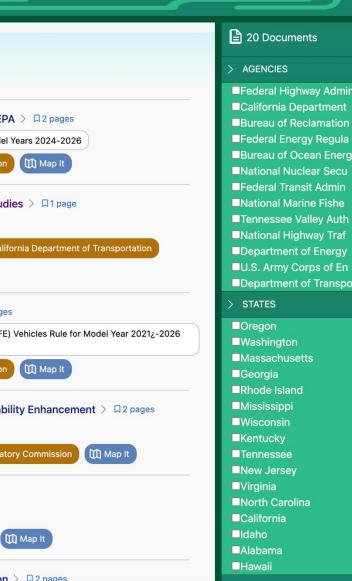
Northwest

Standard Document Full Text Search

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

PNNL An official website enabled by the Pacific Northwest National Laboratory **SearchNEPA** AI For U.S. Environmental And Permitting Reviews • Ask Themis.ai **Document Results** Renewable Natural Gas Help me learn about List all NEPA documents List all documents in List all EPA documents **RNG projects** California National Environmental **Environmental Protection** NHTSA Draft SEIS Comment Letter 20211022 EPA > Q 2 pages Policy Act California Renewable Natural Gas Agency Scorporate Average Fuel Economy Standards for Model Years 2024-2026 🔟 National Highway Traffic Safety Administration 🛛 🛄 Map It + HDC Draft EIR-EIS Vol 2-App N&List of TechStudies > D1 page K High Desert Corridor O Californi fil Federal Highway Administration, California Department of Transportation Document Results with clickable Map It Quick post-search filtering to drill down Salt Lake SAFE Vehicles Rule FEIS Appendices > 🛛 13 pages City into specific set(s) of agencies or states ≺ Draft EIS for The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Year 2021¿-2026 Map zoom in Passenger Cars and Light Trucks Sacrame Link to document viewer n National Highway Traffic Safety Administration Link to project viewer 20221212 EPA Comments DEIS Southside Reliability Enhancement > D 2 pages Las Vega Albuquerque Southside Reliability Enhancement Project O Virginia, North Carolina fil Federal Energy Regulatory Commission Phoenix Mexicali Tucsor NJ Transitgrid DEIS > D 10 pages Ciudad Juárez S NJ Transitgrid Traction Power System New Jersey fill Federal Transit Administration Chihuahua 20221011 EPA Comments DEIS VA Electrification > 2 pages

Keyword Search



Pacific

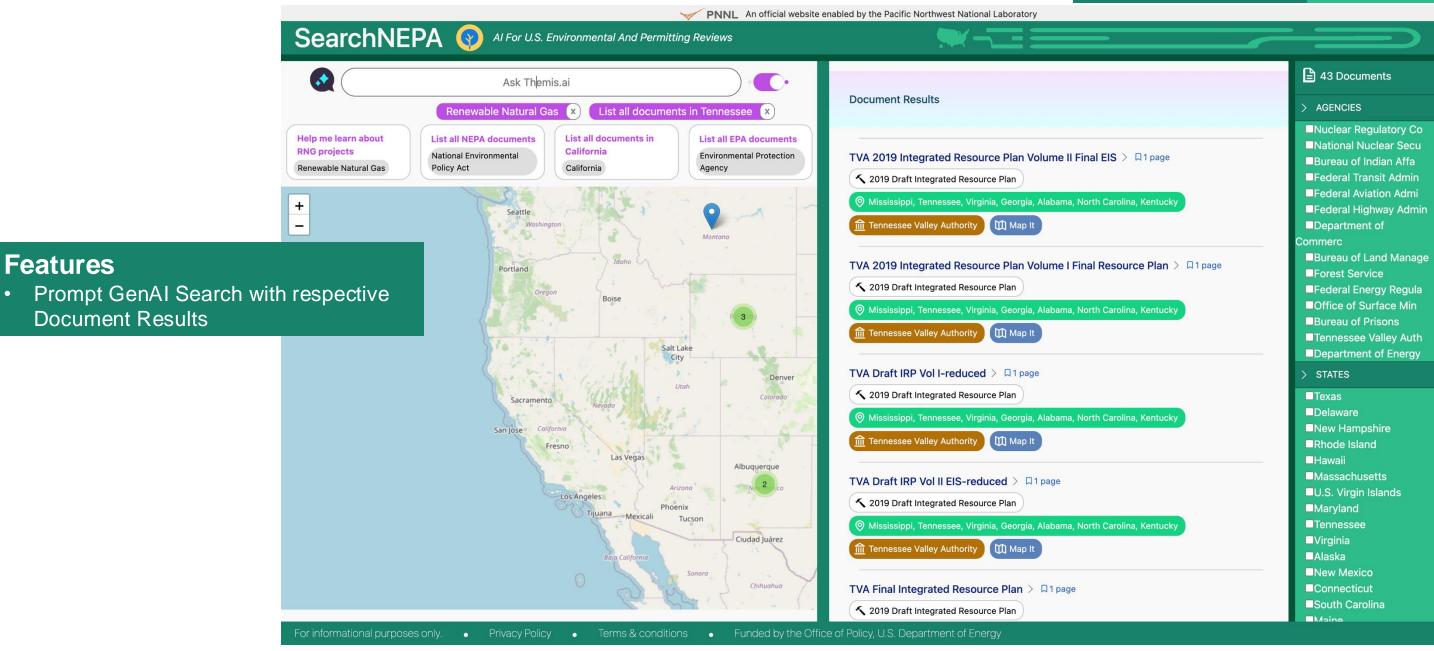
203

490

Northwest

Standard Document Full Text Search

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



GenAl Search



Standard Document Full Text Search

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

101 203

490

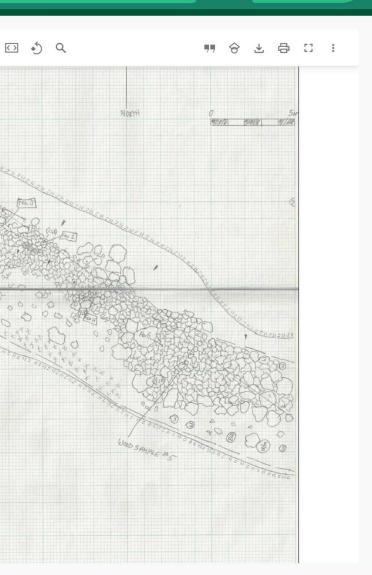
Features

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

PNNL An official website enabled by the Pacific Northwest National Laboratory **SearchNEPA** AI For U.S. Environmental And Permitting Reviews B 3 DEIS SADDLE ROAD EXTENSION V₀I AN ARCHAEOLOGICAL INVENTORY SURVEY R... < 103 / 333 > - 119% + 2 (Appendicies E J) i≡ 🗋 AGENCY > APPENDIX A: **CONSULTATION & PUBLIC** NOTICES **APPENDIX B: CAVES** LOCATED OUTSIDE OF PROJECT AREA Department of Transportation APPENDIX C: RADIOCARBON DATES APPENDIX D: ADDITIONAL SITE PHOTOGRAPHS LOCATION 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 E Leafle' > CHAPTER II. GENERAL Hawaii STUDY METHODOLOGY > CHAPTER IV. DESCRIPTION PROJECT OF FUTURE TRAFFIC NOISE LEVELS CHAPTER V. FUTURE Saddle Road Extension, South Kohala, Hawaii; TRAFFIC NOISE IMPACTS Project Number DP-HI-0200(5) AND POSSIBLE NOISE MITIGATION MEASURES > CHAPTER VI. For informational purposes only.

Privacy Policy
Forms & conditions
Funded by the Office of Policy, U.S. Department of Energy

Document Viewer





SearchNEPA Standard Document Full Text Search

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

PNNL An official website enabled by the Pacific Northwest National Laboratory

SearchNEPA 📀 Al 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

Features

203

490

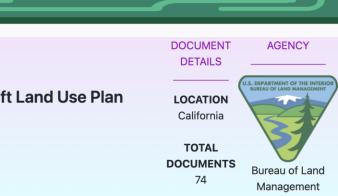
- Displays project and its associated documents and metadata
- Links to documents

OCUMENTS

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 Draft EIS-EIR-PA Appendix U

- <u>Crimson Solar Final EIS-PA</u>
- Crimson Solar Final EIS-PA Appendix A-J
- <u>Crimson Solar Final EIS-PA Appendix K-U</u>
- <u>Crimson Solar Final EIS-PA Appendix V-W</u>
- 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

Project Viewer





G -1

ChatNEPA

Demo Application for NEPA Fact Finding and Topic Summarization



PNNL is operated by Battelle for the U.S. Department of Energy





203

490

ChatNEPA: NEPA Fact Finding Copilot

PolicyAI Copilot V0.021

	Agency Name
gency Name	Bureau_of_Ocean_Energy_Manageme
Choose an option	
Fish_and_Wildlife_Service	Ask me a question about NEPA
FWS	
Office_of_Surface_Mining	👩 Describe The National Outer Co
Utah_Department_of_Transportation	program
Missile_Defense_Agency	Based on the provided context,
Bonneville_Power_Administration	Based on the provided context, and development program invo
National_Marine_Fisheries_Service	Secretary of the Interior overse
Enderal Decarue Pank of San Erancisco	with environmental protection. some off the coast of Alaska, for
	development as required by the

Features:

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

PolicyAI Copilot V0.021

Ocean Energy Management	

8 ~

docs

- ntinental Shelf (OCS) oil and gas exploration and development
- the National Outer Continental Shelf (OCS) oil and gas exploration lves leasing areas of the OCS for oil and gas development. The es the program and is required to balance resource development A 2017-2022 leasing program identified certain areas, including leasing. The purpose is to make OCS resources available for 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

Commenters stated BOEM adequately consult with t did not provide adequate opportunities for tribal in

Commenters said BOEM of adequately consider triba resources, subsistence us treaty rights.

Commenters argued BOEI adequately address tribal in the EIS analysis.

Commenters stated BOEM improve tribal consultation and do more to address ti concerns.

Courses 1 (0.72) Courses 2 (0.72) Courses 2 (0.72)

	BOEM Responses
M failed to tribes and e uput.	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.
did not al cultural ses, and	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.
EM did not l concerns	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.
M should on process rribal	BOEM acknowledged it can improve consultation process and will continue to engage tribes to address concerns and mitigate impacts.



ChatNEPA: NEPA Fact Finding Copilot

٠

•

PolicyAl Copilot V0.021

lgency Name	Tohono O'odham Nation
Bureau_of_Land_Management	 Tonto Apache Tribe
	White Mountain Apache
	Wichita and Affiliated Tribes
Ask me a question about NEPA docs!	Yavapai-Apache Nation
	Ysleta del Sur Pueblo
Solution List down the federally recognized tribes that BLM invited to to participagencies in preparation of the SunZia Southwest Transmission Project	Source 2 (0.03) Source 2 (0.04)
	SunZia Southwest Transmission Project Right-of-V
Based on the provided context, the federally recognized tribes that the	e BLM invited to participate 🕺
as cooperating agencies in preparation of the SunZia Southwest Trans	smission Project EIS are: State: ADOT, AZGFD, ASLD, NMDGF, New Mexico
Ak-Chin Indian Community	New Mexico Military Base Planning and Suppor
Apache Tribe of Oklahoma	• Local: Arizona Counties (Cochise, Graham, Gree
Caddo Indian Tribe	Eloy, Willcox), New Mexico Counties (Grant, Hid
Comanche Indian Tribe	Torrance,
Fort Sill Apache Tribe of Oklahoma	Valencia), New Mexico Cities (Belen, Deming, Lo
Gila River Indian Community	• Tribes: Ak-Chin Indian Community, Apache Trib
Hopi 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,

Navaia Nation

۰

٠

Jicarilla Apache Nation

Kiowa Tribe of Oklahoma

Mescalero Apache Tribe

Salt River Pima-Maricopa Indian Community

San Carlos Apache Tribe

est Transmission Project Right-of-Way Amendment

AZGFD, ASLD, NMDGF, New Mexico Spaceport Authority, NMSLO, State of

a Counties (Cochise, Graham, Greenlee, Pima, Pinal), Arizona Cities (Coolidge, , New Mexico Counties (Grant, Hidalgo, Lincoln, Luna, Sierra, Socorro,

ew Mexico Cities (Belen, Deming, Lordsburg, Socorro, Truth or Consequences)

nin Indian Community, Apache Tribe of Oklahoma, Caddo Indian Tribe,



490

ChatNEPA: NEPA Fact Finding Copilot

SearchNEPA

AI For U.S. Environmental And Permitting Reviews

:=

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

D	>
1.11 BLM PLAN AMENDMENTS	
1.12 PERMITS, LICENSES,	

Final Environmental Impact Statement and Propos...

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

934 / 1050 >

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:

105%

- 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

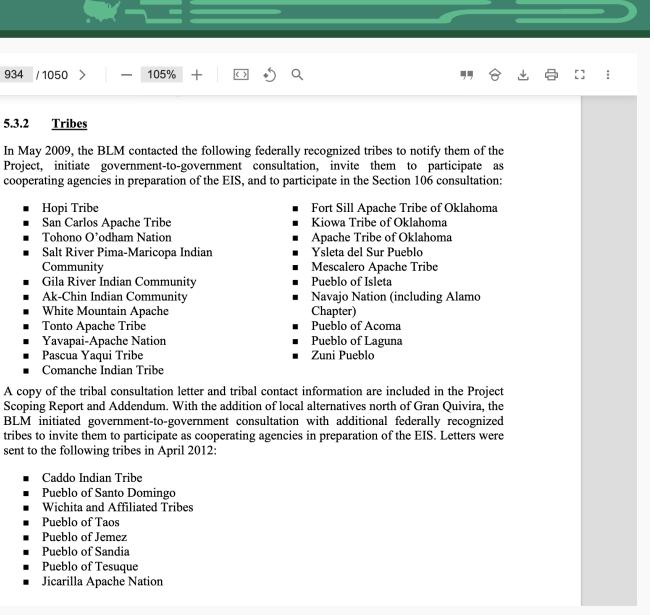
A copy of the tribal consultation letter and tribal contact information are included in the Project Scoping Report and Addendum. With the addition of local alternatives north of Gran Quivira, the BLM initiated government-to-government consultation with additional federally recognized

- 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

- Pueblo of Isleta •
- Chapter) Pueblo of Acoma
- .
- Zuni Pueblo

< >

•) Q





+

0

Ð

 \bigcirc

 $| \rightarrow$

101

203

490

Other Chatbot Solutions

费 Sam... O 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. 诊• Sources

[PDF] SunZia Notice of Availability of [PDF] SunZia ER 🔶 🔇 Southwest a Draft Environmental Southwest Transmission Project... Impact Statement an... Transmission Project . eplanning.blm · 1 🗊 federalregister . 2 🌔 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

Ask follow-up

6 119 National Park Service

- 2. Department of the Army, Fort Bliss
- 3. Department of the Army, White Sands Missile Range

Perplexity: Missing and Inaccurate

ChatGPT 40 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.

- ß 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.

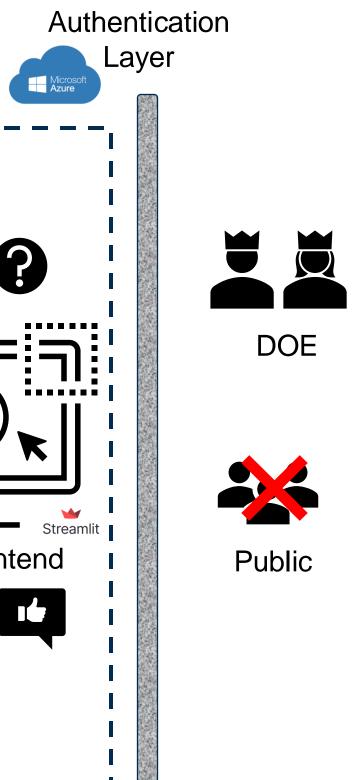
ന

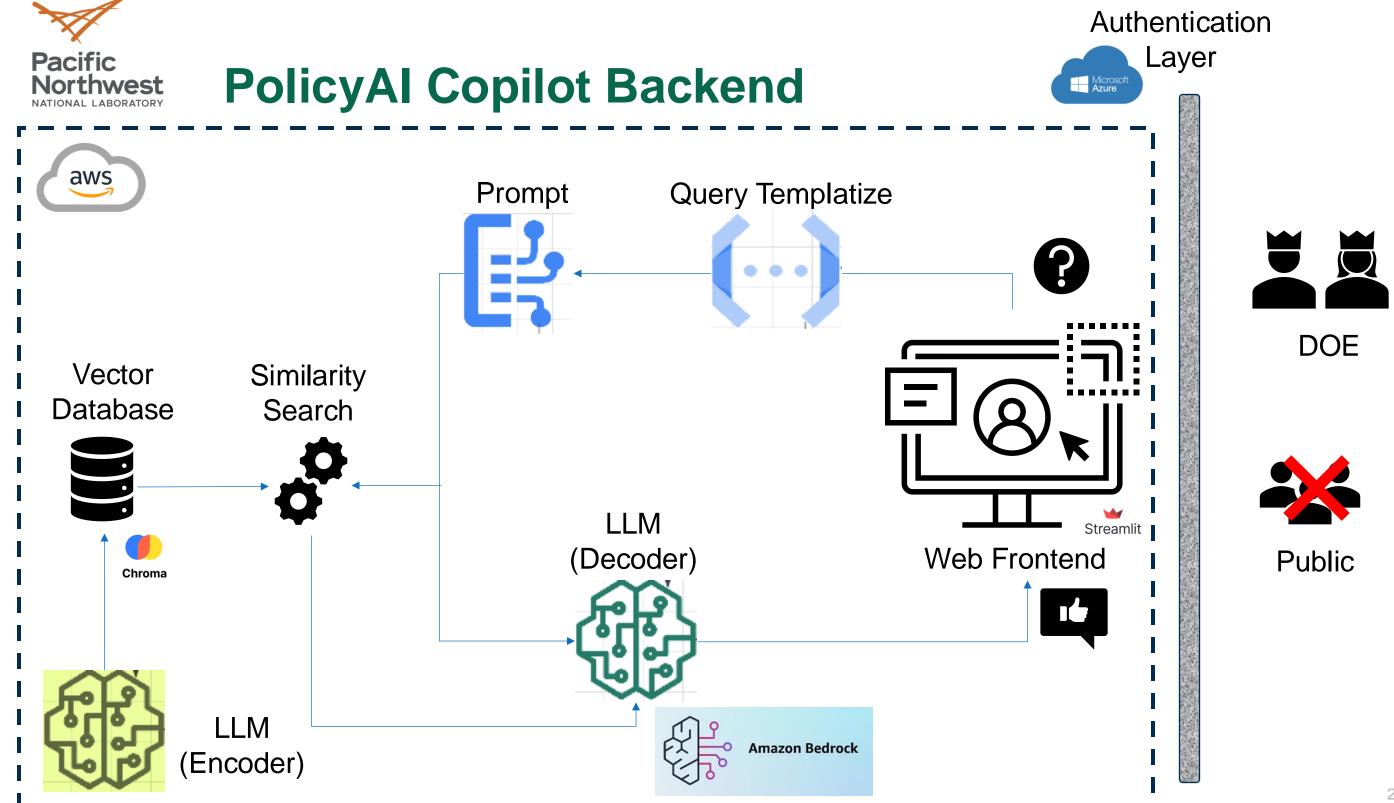
ChatGPT: Incomplete and Missing

Log in	Sign up	
Log III	Sign up	



G -1







490

Systematic Comparison

Q Search					Sign In		Register
POLICYAL -	COMMUNITY	PREDICTION COMPETITION	N · 4 MONTHS AGO		Late	e Submis	ssion
			related to National Environmental Policy Act (NEPA) docume	nts.	U 72-		
Overview	Data Co	de Models Disc	cussion Leaderboard Rules				
.eaderbo	ard				🛃 Raw I	Data	C Refresh
Q Search	leaderboard						
Public Priv	vate						
			nately 20% of the test data. reflects the final standings.				
#	Δ	Team	Members	Score	Entries	Last	Solution
1	<u>^ 2</u>	Ramboll	A	0.53526	5	4mo	
2	~ 1	bimuuuu	۲	0.52682	7	4mo	
3	<u>^ 2</u>	AFS		0.47709	15	4mo	

NEPAQuAD Benchmark

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

Abstract

Oct 2024

16

[cs.CL]

arXiv:2407.07321v2

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 LLMbased 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 NEPAOuAD1.0 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 compliancerelated 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.

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

[♠]Iowa State University

*Pacific Northwest National Laboratory

1 Introduction

Preprint

In this work, we focus on assessing the long-

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).

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



G -1

CommentNEPA

Demo Application for NEPA Public Comments Analyzer



PNNL is operated by Battelle for the U.S. Department of Energy





490

AI-Assisted Workflow for Public Comment Review



Agency receives correspondence from various sources, such as online platform (e.g., Regulations.gov), email, mail, and public meetings. Al and database tools are used to assign each piece of correspondence a unique ID and capture metadata.

All text from each comment submission is bracketed into individual comments tagged by subject matter or denoted as non-comment text by a large language model AI application.



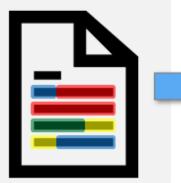


Optional step: The AI application is provided with a guidance document that contains detailed instructions how comments should be categorized. This helps achieve greater alignment between the Al-produced results and human expectations. It also allows the AI application to and tailor its results to the unique requirements or preferences of each agency.



Human subject matter experts review and refine comment bracketing and categorization to ensure completeness and accuracy.





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

Result after human review and refinement is sent back to the AI application as training to improve performance.



NEPA Public Comment Analysis

101

203

490

Pacific

Northwest

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 guotes 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 guote 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.

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		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		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		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.

Prompt

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



490

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:

BOEM Respons
BOEM stated it of government corr opportunities for BOEM acknowle engage with trib
BOEM stated it of resources and w stages of OCS pl mitigate impact
BOEM said it con developing the continue to eng becomes availal
BOEM acknowle process and will concerns and m

ses

- conducted government-to-
- onsultation with tribes and provided
- for input throughout the process.
- edged ongoing duty to consult and bes.

considered potential impacts to tribal will continue to do so through later planning. BOEM will work to avoid or ets.

onsidered tribal input and concerns in EIS analysis. BOEM stated it will gage tribes as additional information able.

edged it can improve consultation Il continue to engage tribes to address nitigate impacts.



G -1

Al Best Practices



PNNL is operated by Battelle for the U.S. Department of Energy





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

OpenAl propsed 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



PolicyAl 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: <u>NLP NEPA Benchmark NEPAQuAD</u>
 - Expert Testing: <u>Feedback Survey</u>
 - Scenario Focused Human-centered Evaluation: <u>Testing AI Tools to Streamline the</u> **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)



G -1

Discussion



PNNL is operated by Battelle for the U.S. Department of Energy





The Role of AI/LLM in Interconnection Reforms

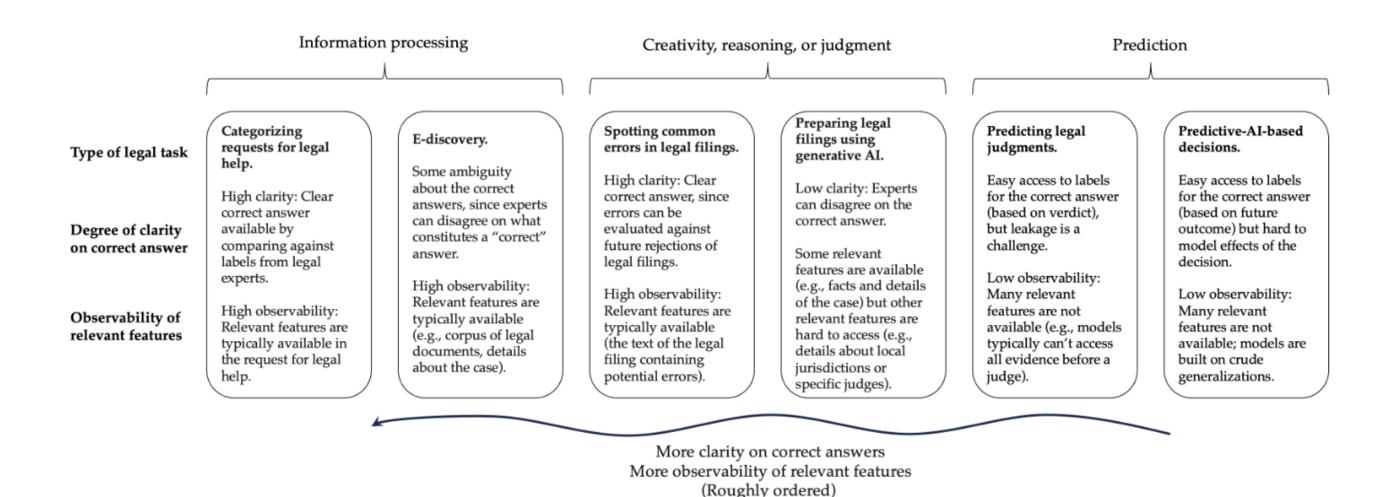
- Updating grid-modeling software, including greater automation of interconnection studies, and **interconnection application processing**, has been identified as a priority area for improving interconnection times
- **Interconnection Application Preprocessing:** Automatically screening and ulletvalidating 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



490

What We Should Use AI for?



Kapoor, Sayash, Peter Henderson, and Arvind Narayanan. "Promises and pitfalls of artificial intelligence for legal applications." arXiv preprint arXiv:2402.01656 (2024).



PolicyAl Team



(PI)



Sameera Horawalavithana

Sai Munikoti (Co-PI)



Shivam Sharma (Thrust Lead)



Mike Parker (Domain Lead)



Dan Nally (Domain Lead)



Anurag Acharya

(Thrust Lead)



Lead)





Alex Buchko



Tim Vega (Engineering Lead)



Cameron Rutherford



Mahantesh Karl Pazdernik Halappanavar (Advisor) (Advisor)



Sridevi Wagle

Kathy Nwe





Derek

Lilienthal

Ann Miracle (Advisor)



Sarthak Chaturvedi



Amanda Reed



Heng (Alfred)

Wan

(Past)



Karen Dsouza (Past)



(Past)

Phan Hung



Anastasia Bernat (Thrust



Rounak Meyur



Sadie Montgomery (Domain Lead)



Sai Koneru

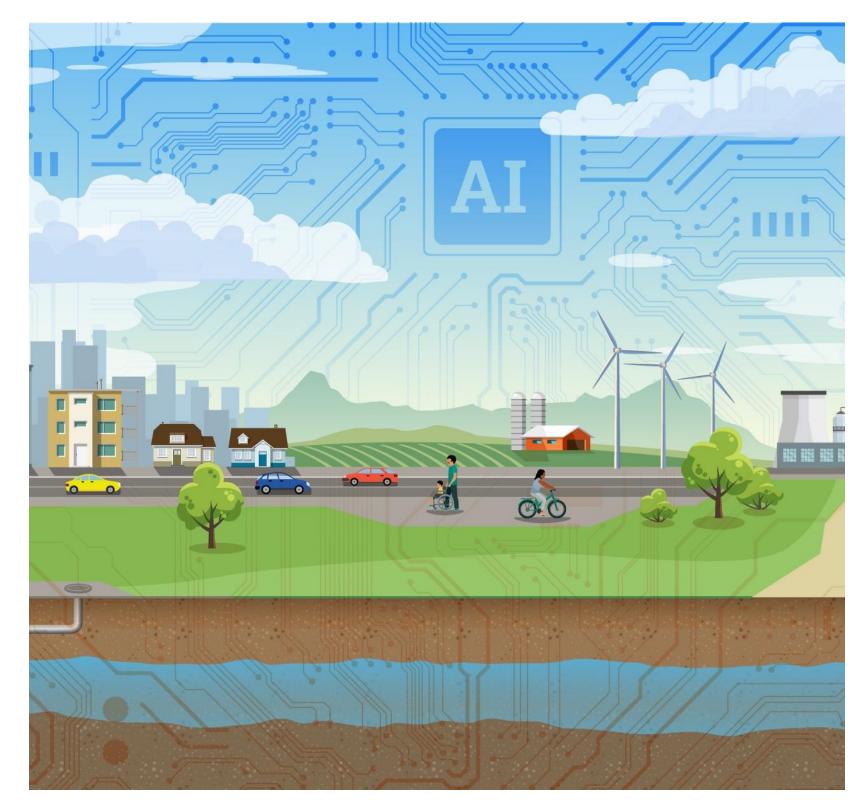


Srinath Kannan



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

Sameera Horawalavithana, Ph.D. yasanka.horawalavithana@pnnl.gov

Stay Engaged.

https://www.pnnl.gov/projects/policyai



PNNL is operated by Battelle for the U.S. Department of Energy

