

Adopting Al Tools for Improving Permitting Outcomes and Efficiency

3/11/25

Sameera Horawalavithana, Ph.D.



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

PNNL-SA-209191



Origins and Initial Steps



Pacific

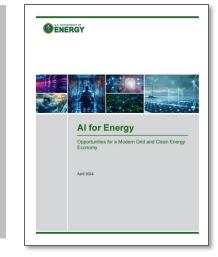
Northwest

The U.S. Department of Energy (DOE) <u>has announced</u> <u>many actions</u> to assess opportunities and challenges of Al for purposes of managing growing energy demand.

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

) ha 🕚 Fr 🗑 W 💈	N P P	Pi 🦲 Ei 🎴	P 🗐	IF 📵	S(p 🗋	F: Q	b 📉	TI 😌	Si 🎦	G	E
ipartisanpolicy.org/rep	port/categorical-	exclusions/								A		z

A Constraint and their investors which discourages private capital investment and can icopardize Source: Council on Environmental Quality



DOE 2024

EPORTS

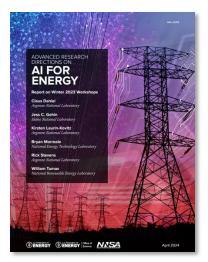
2

5

les.



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



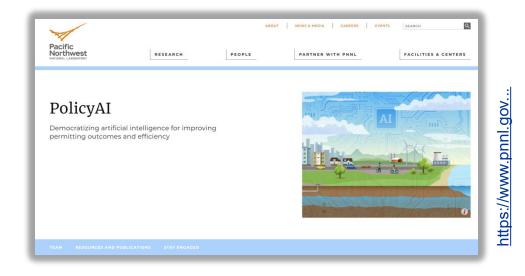
DOE 2024



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



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

- PolicyAl is the anchor project in DOE's \$20 million VoltAlc 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



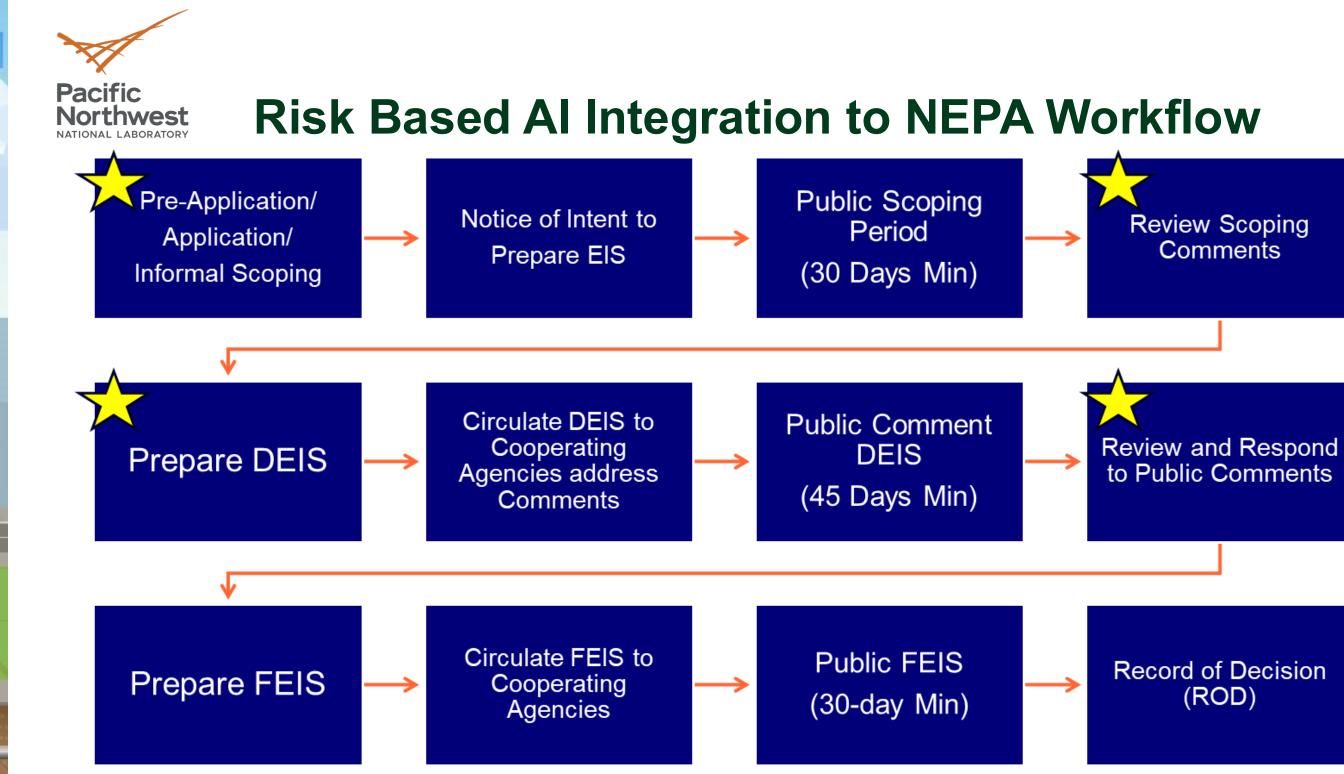
Guiding Principles

PolicyAI is a policy-specific multimodal large language model (LLM) test bed seeking to...

Judiciously apply artificial intelligence (AI) to improve permitting outcomes and efficiencies, particularly for National Environmental Policy Act (NEPA) and related reviews

Introduce AI features that improve accessibility and transparency of permitting processes and information to the public

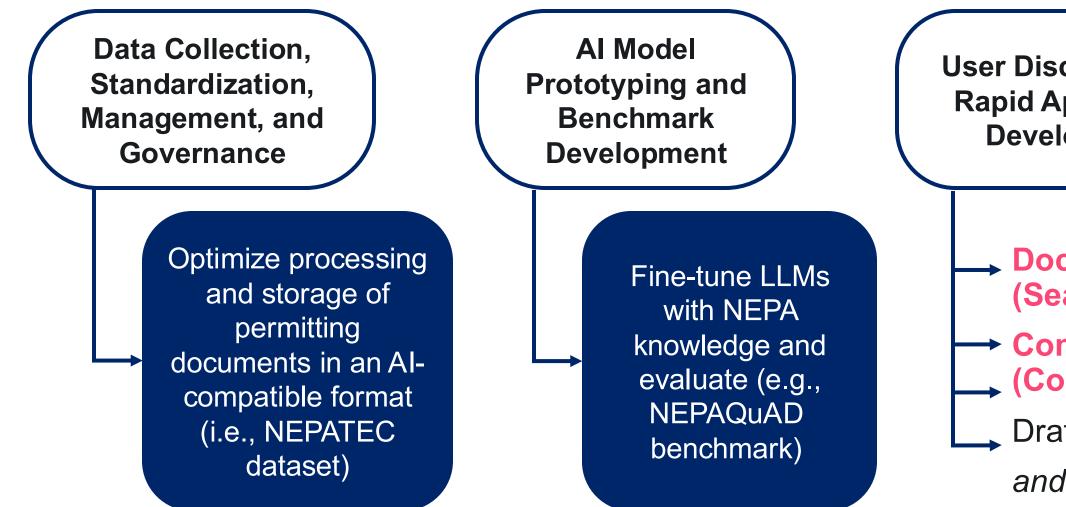




Slides Attribution to Keith Benes, DOE 3/11/25



Thrust Areas



User Discovery and Rapid Application Development

Document Search (SearchNEPA)

Comment Analysis (CommentNEPA)

Drafting Assistant

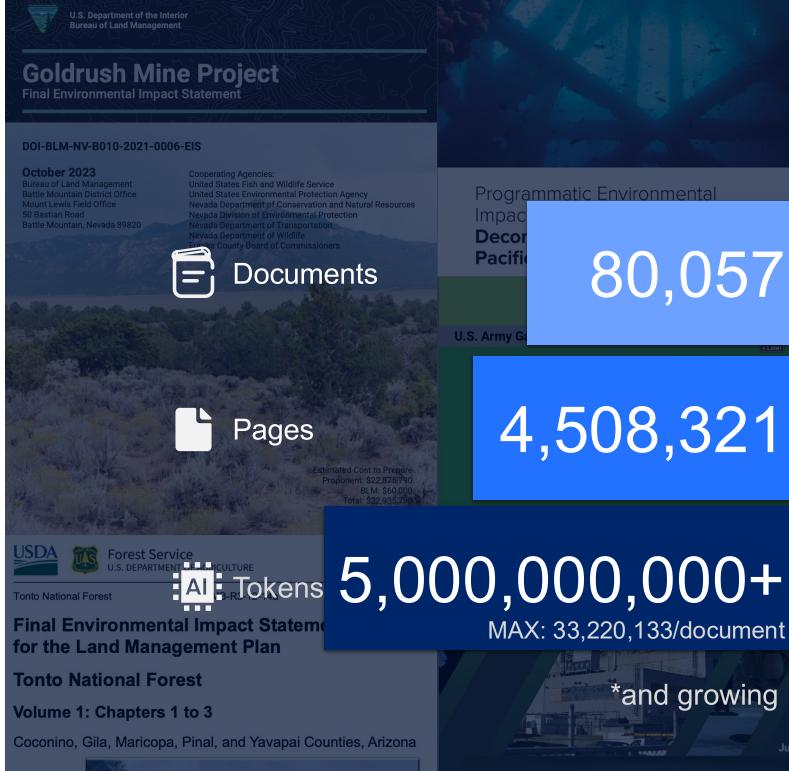
and more to come



Pacific Northwest NATIONAL LABORATORY **Data Collection**, Standardization, Management, and

Governance

Optimize processing and storage of **Review/Permitting** documents in an Alcompatible format (e.g., NEPATEC dataset)



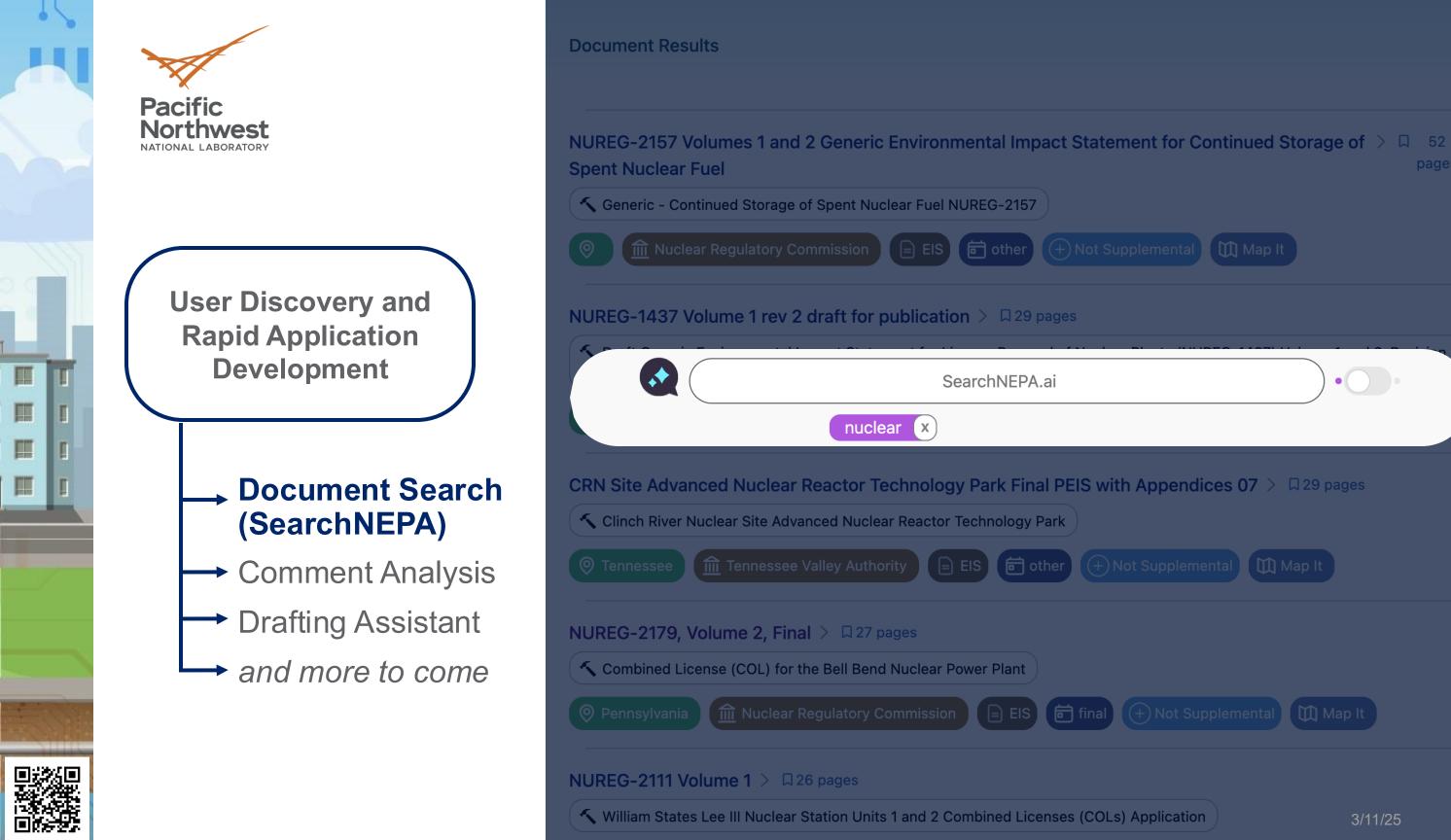
Programmatic Environmental

80,057

MAX: 33,220,133/document

*and growing

July 2022

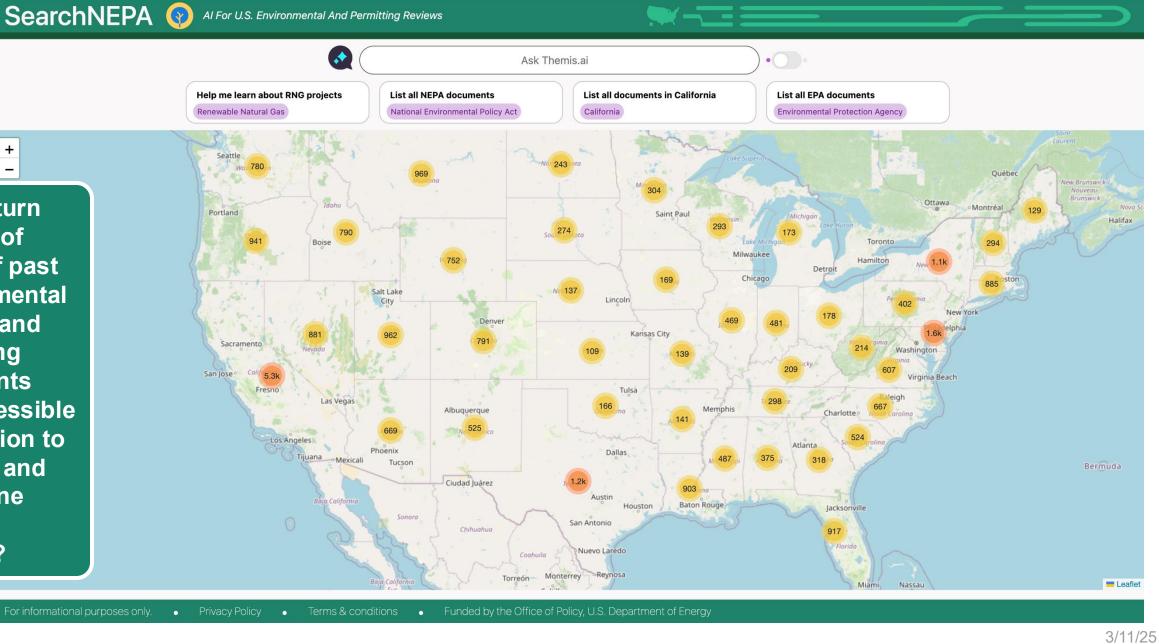






SearchNEPA

PNNL An official website enabled by the Pacific Northwest National Laboratory



Can we turn millions of pages of past environmental reviews and permitting documents into accessible information to improve and streamline current reviews?

+

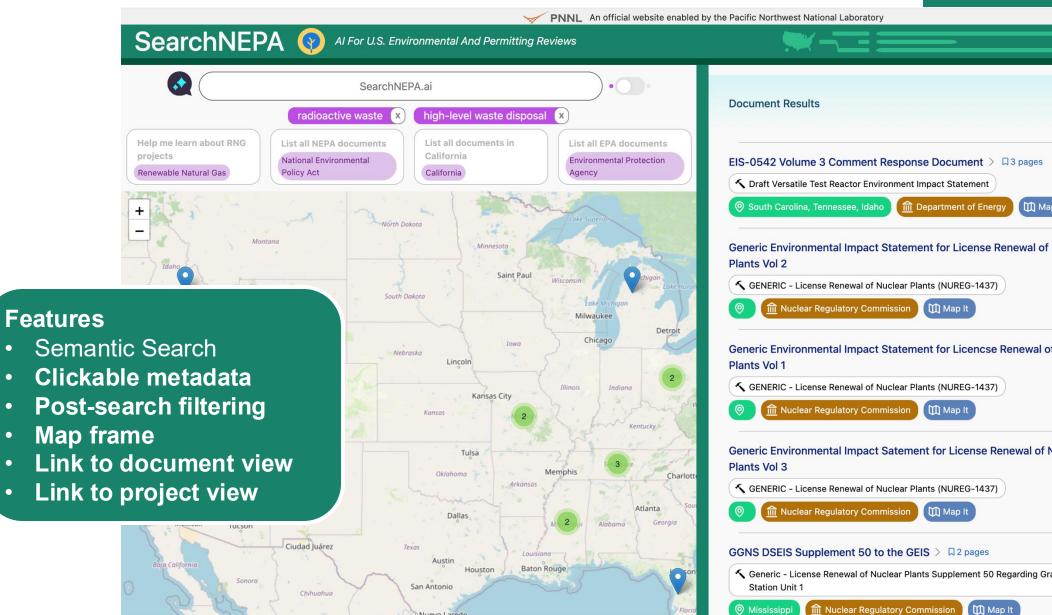
Home

Version 1.0



SearchNEPA

Semantic Search



Version 1.0

	20 Documents
	> AGENCIES
	 Nuclear Regulatory Co Department of Energy
p It	> STATES
Nuclear > □ 2 pages f Nuclear > □ 2 pages	 Michigan Florida California Mississippi South Carolina Tennessee Virginia New Hampshire Maryland Missouri Pennsylvania Idaho
	□Ohio
Nuclear > D 2 pages	
and Gulf Nuclear	



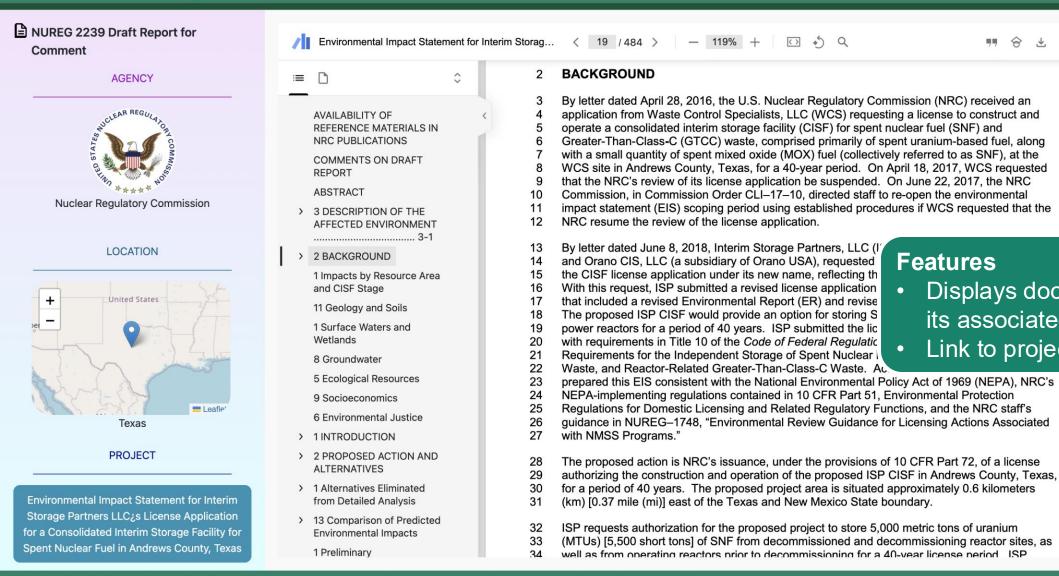


SearchNEPA

AI For U.S. Environmental And Permitting Reviews

SearchNEPA

PNNL An official website enabled by the Pacific Northwest National Laboratory





Version 1.0

e -E3 8

Features Displays document and its associated metadata Link to project viewer

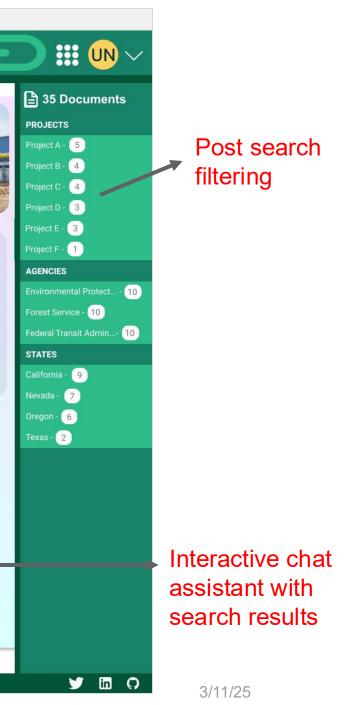


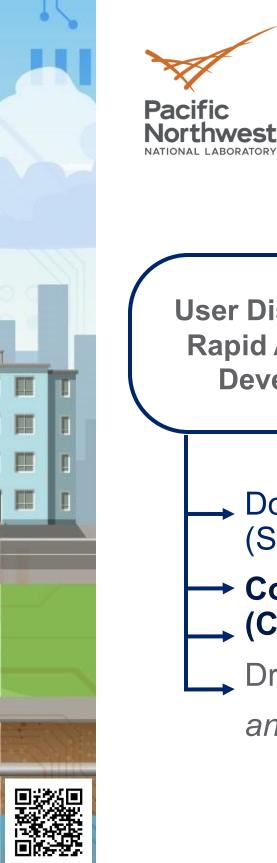
PNNL An official website enabled by the Pacific Northwest National Laboratory

SearchNEPA () AI For U.S. Environmental And Permitting Reviews

Pacific Northwest

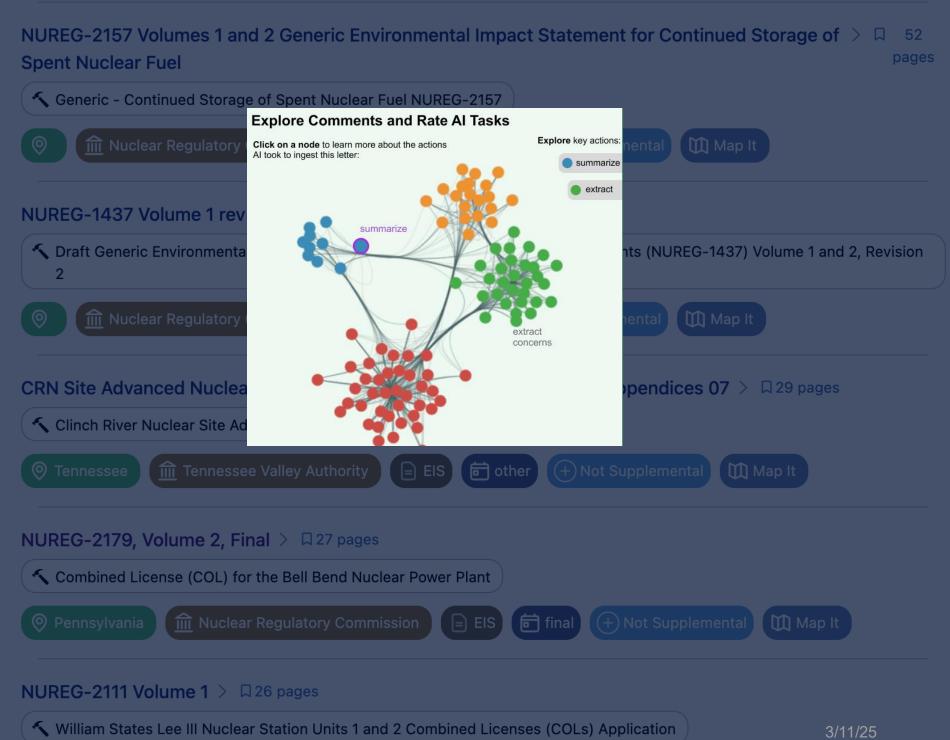
		ChatNEPA	12
		Renewable Natural Gas (RNG)	
	Document Results	Renewable Natural Gas (RNG) projects focus on producing natural gas from renewable sources, typically biodegradable materials	
	Tell us how we're doing on a new version of SearchNEPA.	such as organic waste, agricultural residues, or wastewater. Here are some potential RNG projects:	
	Take the survey	 Pioneer Ridge RNG Project (Colorado) Type: Landfill Gas-to-RNG 	
		 Summary: Captures methane from the Pioneer Ridge Landfill and converts it to RNG for injection into the natural gas grid. 	Ask ChatNEPA related topics
	Search Settings	 Benefits: Reduces greenhouse gas emissions by preventing methane release. 	+ How does solar panel
	Group document project	2. Dairy RNG Project (California) • Type: Dairy Waste-to-RNG	technology impact land requirements?
		 Summary: Converts methane from dairy manure into RNG through anaerobic digestion. Benefits: Reduces methane emissions from agriculture and 	How much land is needed for a 1 MW solar farm?
	 ► IRS-2023-0066-29759 attachment 1 ► 382 recent views () colorado () Forest Service () EIS () Final () Not Supplemental () Map It 	supports clean energy goals.	+ Solar farm acreage per MW
	Short Description Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod. Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod.	3. Pine Tree Dairy RNG Project (Washington) Type: Dairy Waste-to-RNG Summary: Processes dairy manure into RNG, injected into the	in different geographical regions
- ·	► IRS-2023-0066-29607 attachment 1 2 112 recent views	local gas pipeline. Benefits: Mitigates greenhouse gas emissions from livestock 	
Search —	© colorado	operations. 4. SEST RNG Project (Illinois)	
results	Short Description Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod. Lorem ipsum dolor sit i consectetur adipiscing elit, sed do eiusmo.	• Type: Agricultural Waste-to-RNG • Summary: Converts swine manure into RNG using anaerobic	
	► IRS-2023-0066-29706 attachment 1 2 23 recent views	 digestion. Benefits: Reduces methane emissions from pig farming and provides renewable energy. 	
	🔨 Project A 💿 colorado 🏦 Forest Service 🕅 Map It 🛅 Schedule 🚍 PDF		
	Short Description Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod. Lorem ipsum dolor sit i consectetur adipiscing elit, sed do eiusmo.	5. Highmark RNG Energy (Multiple States) Type: Landfill and Agricultural Waste-to-RNG Summary: Develops multiple RNG projects across the U.S., 	
	IRS-2023-0066-29748 attachment 1	including landfill and agricultural waste conversion.	
	Metadata 🕅 Map It	ይወ	
	Short Description Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod. Lorem ipsum dolor sit a consectetur adipiscing elit, sed do eiusmo.	net, Ask ChatNEPA.ai	0 🗐
	► IRS-2023-0066-29759 attachment 1 🗠 382 recent views	Close Chat AI can make mistakes. Check responses.	
	🛞 colorado 🏾 🏦 Forest Service 📄 EIS 🖨 Final 🛞 Not Supplemental 🅅 Map It		
	Short Description Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod. Lorem ipsum dolor		
	For informational purposes only. Privacy policy Terms & conditions	Funded by the Office of Policy, U.S. Department of Energy	





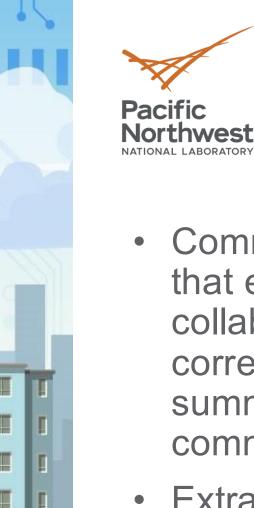
Document Results

Spent Nuclear Fuel



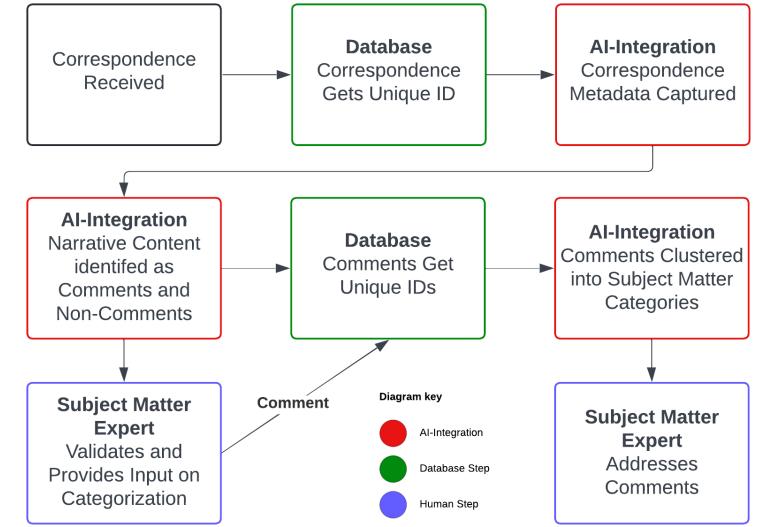
User Discovery and Rapid Application Development

- **Document Search** (SearchNEPA)
- **Comment Analysis** (CommentNEPA)
- Drafting Assistant and more to come



CommentNEPA: Public Scoping Comment Analysis

- CommentNEPA is an application that enables human-Al collaboration to rapidly and correctly identify, extract, cluster, summarize, and respond to public comments.
- Extraction of comments into clusters for human evaluation; human-reinforced AI comment summarization and response.
- **Potential value**: Hundreds of hours per project will be saved initially, and more as the tool matures.



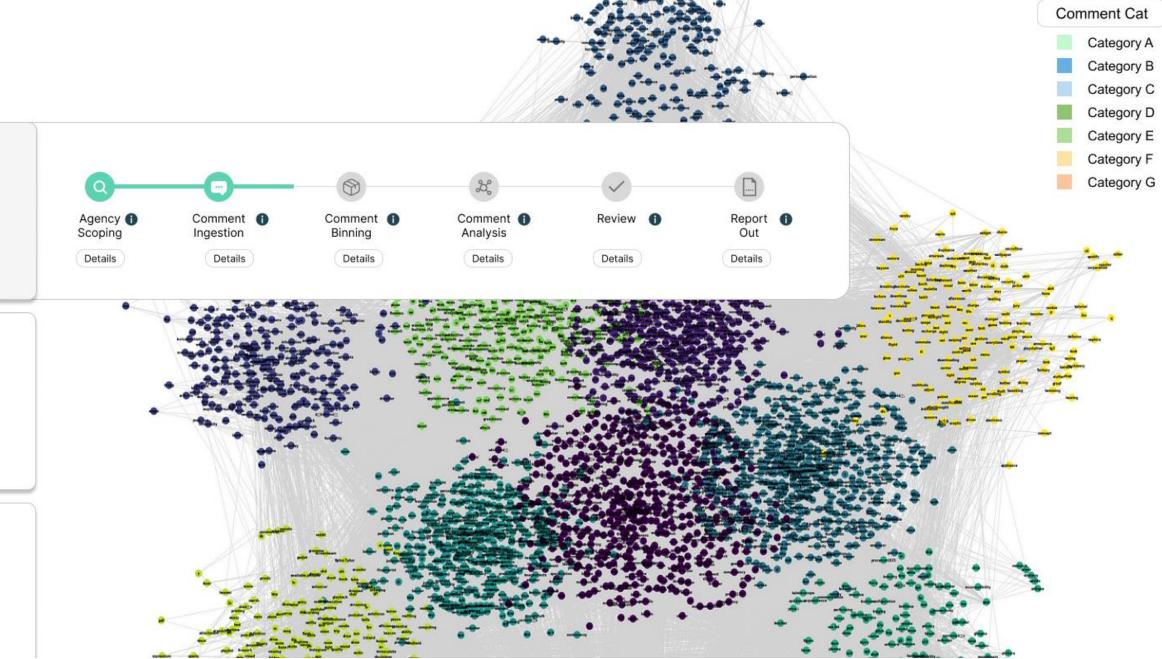
PNNL An official website enabled by the Pacific Northwest National Laboratory

CommentNEPA 🚱

AI For U.S. Environmental And Permitting Reviews



🛗 Wednesday, January 8, 2024



3 Open Projects





CommentNEPA 😵	Correspondence	Comments	Letter Graph Chat			
PROJECTS Project A	Letter from Solectria Renewables, LLC	Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.	Call			
Project B Project C	Posted : Jun 24, 2024	Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.	Domestic Content Bonus Credit Amounts under the Inflation			
	Letter from Ingeteam Inc. 57 comments	Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.	Reduction Act of 2022: Expansion of Applicable Projects for Se Harbor in Notice 2023-38 and New Elective Safe Harbor to Determine Cost Percentages for Applicable Percentage Rule			
PROGRESS Agency Scoping ✓	Posted: Jun 6, 2024	Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.	(Notice 2024-41)			
Comment Ingestion 🗸 Comment Binning	Letter from Construction Innovations LLC 54 comments	Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.	C Letter 06/21/2023 7:31 PM (color			
Comment Analysis	Posted: July 22, 2024 Letter from Edison	Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.	Subject: Comment from Solectria Renewables, LLC			
Review Report Out	Electric Institute 21 comments Posted: July 15, 2024	Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.	U.S. Treasury Department & Internal Revenue Service			
	Letter from Solar Energy Manufacturers for	Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.	Dear Solar Industry Supporters, Solectria Renewables, LLC (Solectria) is a leading U.S. PV Inverter manufacturer with headquarters in Lawrence,			
	America Coalition 12 comments Posted: July 16, 2024 Letter from Trane Technologies 11 comments	Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.	Massachusetts. Our company was founded in 2004 and ha been in business continuously for the past twenty years. In the early 2010's, the majority of domestic inverter manufacturers were driven out of business due to intense pricing competition from Asian imports. Solectria is the only survivor. In 2014, Solectria was acquired by Yaskawa			
		Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.				
	Posted: July 16, 2024 Letter from Allco Renew.	Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.	America, Inc. (YAI), and we now operate as a wholly owned subsidiary of YAI.			
	Energy Limited 4 comments Posted: July 16, 2024	Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.	The IRA Tax credits are pivotal to Solectria and to other domestic inverter manufacturers' long term future, as we continue to face predatory pricing challenges from foreign			
	Letter from Solar Dynamics LLC	Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.	manufacturers. While the 45X production tax credit solves part of this problem, it is not sufficient. Stronger incentives a needed to encourage project developers to choose domest			
	4 comments Posted: July 16, 2024	Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.	inverters over the lower cost alternatives.			

Π

F

П

Inflation ects for Safe rbor to age Rule

⊚ colorado

U.S. PV nce, 04 and has years. In

intense the only awa olly owned

other , as we n foreign lit solves centives are e domestic



CommentNEPA 😵	Correspondence	Comments	Graph Letter B	
PROJECTS	Latter from Oals ship	OPPOSING TAX CREDITS	·	
Project A	Letter from Solectria Renewables, LLC	"While the 45X production tax credit solves part of this problem, it is not	Explore Comments and Rate AI Task	
Project B	Posted: Jun 24, 2024	sufficient."	Click on a node to learn more about the actions Al took to ingest this letter:	
Project C	Letter from Ingeteam Inc.	"The new Safe Harbor method enables Project Developers to qualify for the 10% Bonus Credit without purchasing U.S. manufactured Utility PV inverters. [] In our opinion, this should not be permitted."		
PROGRESS	Posted: Jun 6, 2024	"In our opinion, this should not be permitted."		
Agency Scoping 🗸				
Comment Ingestion \checkmark	Letter from Construction Innovations LLC	"We are concerned that rigid domestic content requirements could delay the timely deployment of renewable projects."		
Comment Binning 🗸 Comment Analysis	54 comments Posted: July 22, 2024	"We believe that streamlining the tax credit process and eliminating unnecessary administrative hurdles is crucial to accelerating the clean		
	Letter from Edison	energy transition while keeping costs manageable for customers."		
Report Out Review	Electric Institute	"As partners in the energy transition, utilities are committed to helping design policies that support the growth of renewables while maintaining reliable and affordable service for customers."		
Review	Posted: July 15, 2024	"The clean energy economy will benefit from a diversified supply chain,		
Letter from Solar Energy Manufacturers for America Coalition 12 comments Posted: July 16, 2024 Letter from Trane Technologies		and we urge policymakers to consider the global nature of energy markets."		
	"The current patchwork of tax credits and incentives can be difficult to navigate for utilities and developers. Simplifying these programs would make it easier to deploy renewable energy projects quickly."			
		"We must be cautious about implementing policies that could inadvertently slow down renewable energy deployment or increase costs to ratepayers."		
	11 comments	FAVORING INCENTIVES	•• <u>\</u>	
	Posted: July 16, 2024 Letter from Allco Renew. Energy Limited 4 comments Posted: July 16, 2024	"From our perspective, the domestic content bonus credit is designed to incentivize PV project developers to purchase U.S. manufactured products instead of low-cost foreign sourced items."		
Energy Limited 4 comments Posted: July 16, 2024 Letter from Solar Dynamics LLC 4 comments Posted: July 16, 2024		"Ideally, the bonus credit rules should ensure that project developers use only U.S. made Project Components whenever that is possible."	You are an environmental analyst tasks with ensender public commentary on a proposal while ensuring it acc concerns raised about environmental impacts. Your rol	
	Dynamics LLC	"Solectria is the only survivor."	provided summary for an deviations from the source to environmental concerns, or any added editorializing. Y be constructive, focusing on improving the summary's document and its comprehensive coverage of environ	
		"The IRA's incentives are a critical part of the transition to a clean energy future, and they provide the necessary financial support for both utilities and renewable energy developers to build a resilient grid."	NODE RESPONSE	
	Letter from SMA America	"The IRA's tax credits are essential to the long-term success of renewable energy integration, allowing us to ensure reliable, affordable, and clean energy for our customers."	The summary provided is generally accurate and refle Solectria's public commentary. It correctly identifies the incentives and opposition to tax credits. However, the improved by addressing the following points:	
	Posted: July 12, 2024	"We support policies that enable both utilities and independent power producers to deploy renewable generation at scale, while also ensuring grid reliability and resilience against extreme weather events."	How well does the Al perform? Rating Sub	







PolicyAl Team





Sameera Sai Munikoti Horawalavithana (Co-PI)



Shivam Sharma (Past)



Mike Parker (Domain Lead)



Dan Nally

(Domain Lead)





Anurag Acharya (Thrust Lead)



(PI)

Tim Vega (Thrust Lead)



Cameron Rutherford



Taylor Edwards



Sridevi Wagle



Kathy Nwe

Cleve Davis

Derek



Lilienthal

Reilly Raab

Koby Hayashi







Sarthak

Chaturvedi

Amanda Reed



Kaustav Bhattacharjee



Heng (Alfred)

Wan

Mahantesh

(Past)

Phan Hung

Gihan Panapitiya (Past)



Karl Pazdernik Halappanavar (Advisor) (Advisor)





Alex Buchko



Anastasia Bernat (Thrust Lead)



Rounak Meyur



Sadie Montgomery (Domain Lead)



Sai Koneru



Karen Dsouza (Past)



Ann Miracle (Advisor)



Srinath Kannan



Bethel Tarekegne (Project manager)



Stay Engaged

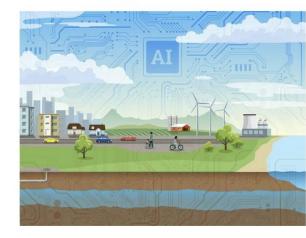
Subscribe to PolicyAl Newsletter !





INAUGURAL ISSUE | DECEMBER 2024

Introducing AI-Driven Tools for Environmental Permitting



PolicyAl is building a policy-specific artificial intelligence (AI) testbed that will be used to develop software to augment National Environmental Policy Act (NEPA) and related environmental reviews. This includes a comprehensive NEPA Data Platform, large language models, evaluation benchmarks, and multiple Al applications to assist the NEPA decision-making process.

PolicyAl is a flagship project under VoltAlc, a U.S. Department of Energy (DOE) initiative to streamline siting and permitting of critical energy infrastructure. Since its inception, PolicyAl has brought together multiple federal agencies, including the Department of Commerce and the Department of Interior, to address shared needs and serve high impact use cases, such as DOE's General Counsel, CHIPS for America, and the National Institute of Standards and Technology.

READ MORE



Pacific Northwest

Thank you

To learn more about our PolicyAl team, resources, and publications, visit <u>pnnl.gov/projects/policyai</u> or email us at <u>policyai@pnnl.gov</u>

Sameera Horawalavithana, Ph.D.

Principal Investigator (PI) Senior Data Scientist Physical and Computational Science Directorate Pacific Northwest National Laboratory yasanka.horawalavithana@pnnl.gov

PNNL-SA-209191

