AI in the USA: Technology's Potential to Improve the National Environmental Policy Act (NEPA) Impact Assessment Process

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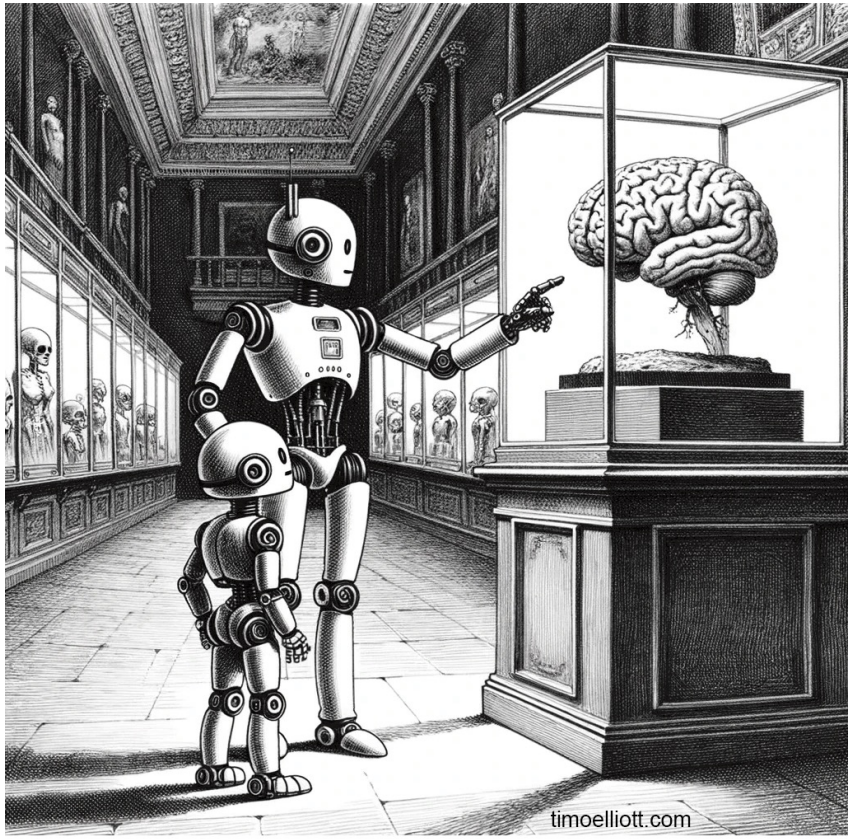


"And that is the original processor!"

Friday May 2, 2025

IAIA25 BOLOGNA ITALY

The National Environmental Policy Act of 1969

THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969, as amended (Pub. L. 91-190, 42 U.S.C. 4321-4347, January 1, 1970, as amended by Pub. L. 94-52, July 3, 1975, Pub. L. 94-83, August 9, 1975, and Pub. L. 97-258, § 4(b), Sept. 13, 1982)

An Act to establish a national policy for the environment, to provide for the establishment of a Council on Environmental Quality, and for other purposes.

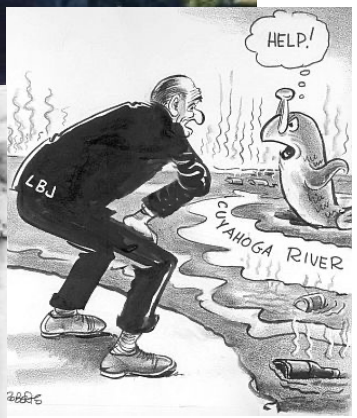
Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "National Environmental Policy Act of 1969."

PURPOSE

Sec. 2 [42 USC § 4321].

The purposes of this Act are: To declare a national policy which will encourage produc-

The purposes of this Act are:
To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality


HELP!
LBJ
CUYAHOGA RIVER

NEPA Section 102: Requirement to prepare an “EIS”

- All agencies of the federal government shall Include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on:
  - (i) the environmental impact of the proposed action,
  - (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
  - (iii) alternatives to the proposed action,
  - (iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
  - (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

NEPA Regulatory and Legal Context

- General:
  - Statute (42 USC 4321)
  - CEQ NEPA regulations (40 CFR 1500-1508)
  - CEQ NEPA guidance memoranda
  - Federal Court decisions
- Agency-specific:
  - Agency NEPA regulations/procedures
  - Agency guidance, handbooks, and manuals

NEPA Regulatory and Legal Context

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- Agency-specific:
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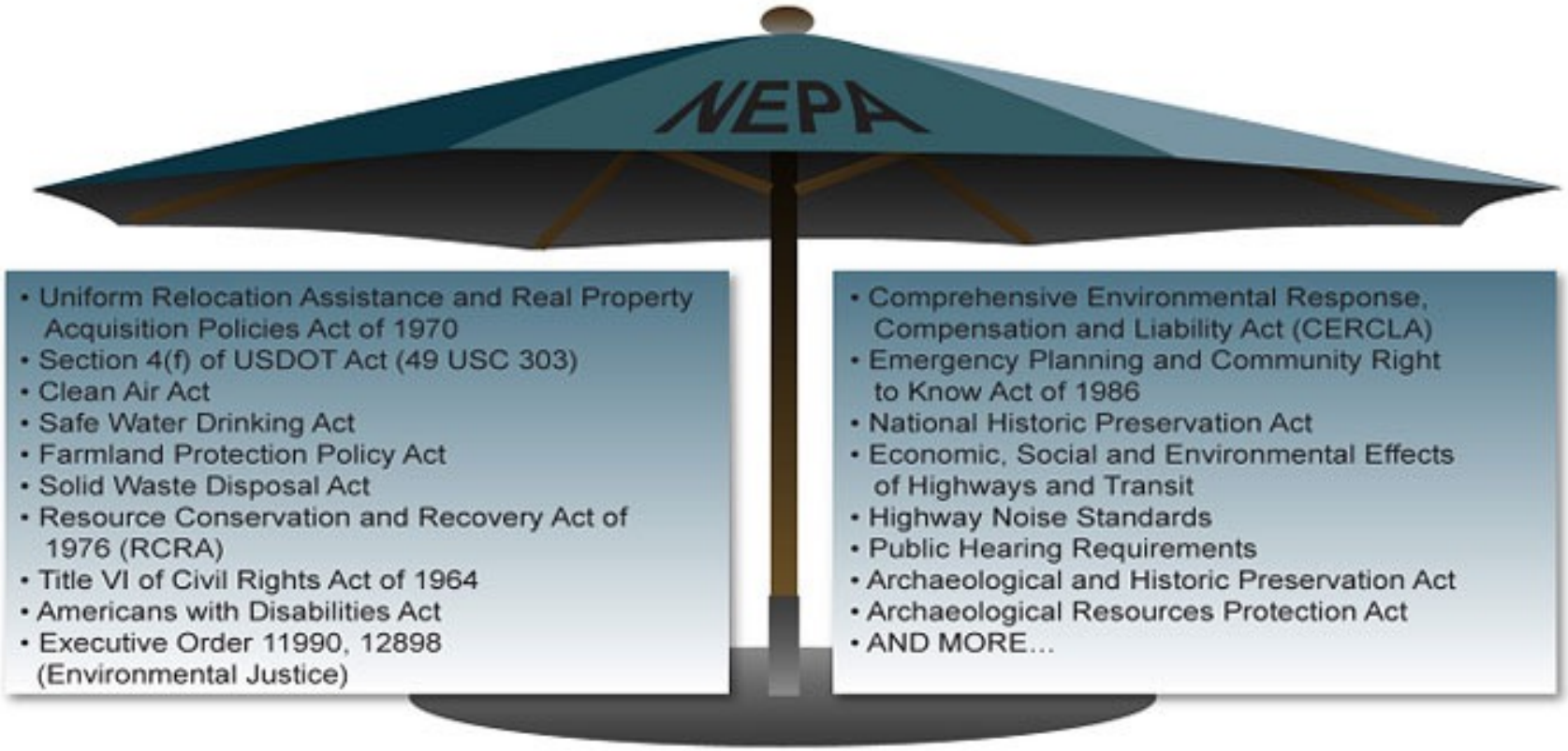
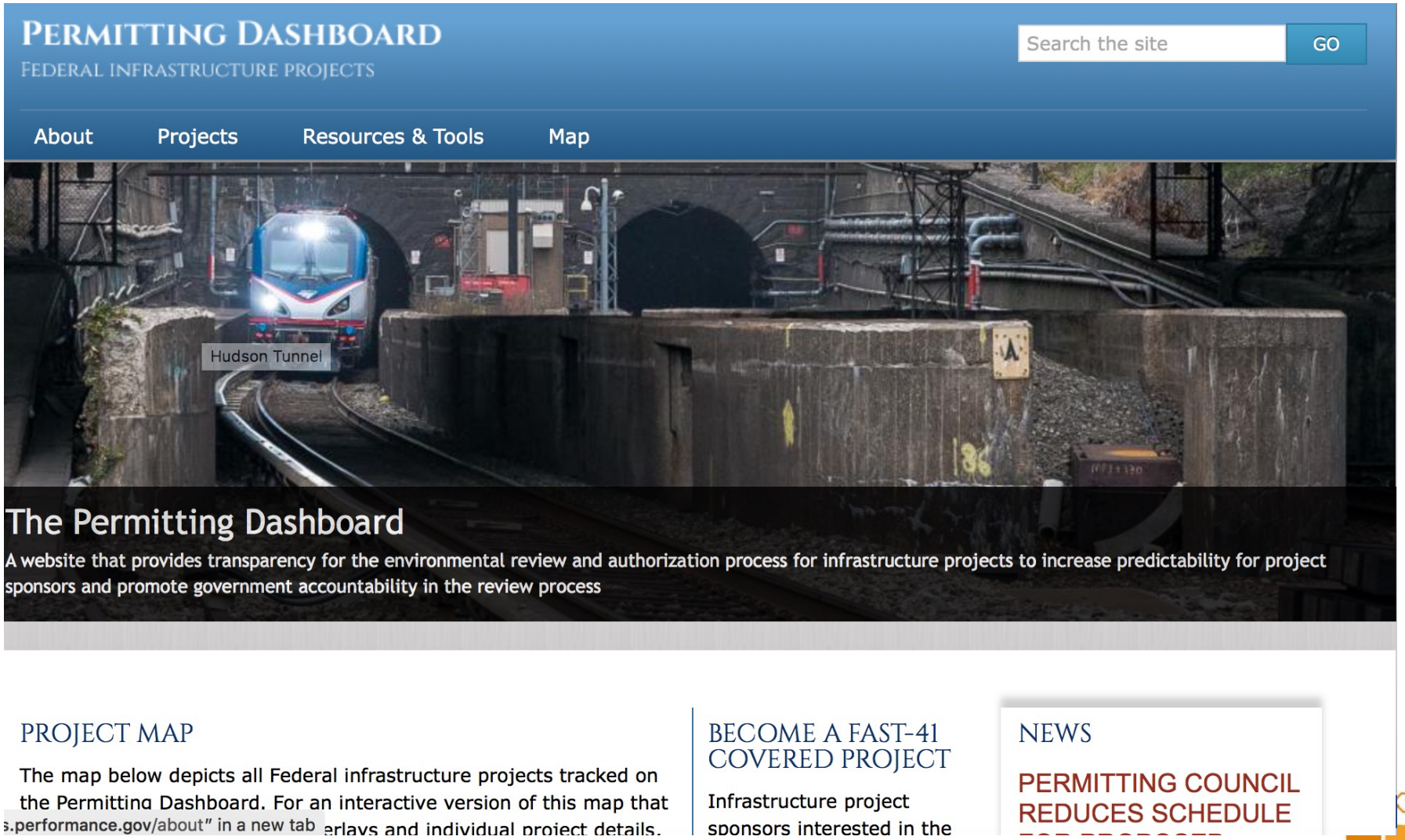
What's "Wrong" with NEPA?

NEPA Document as the “umbrella”



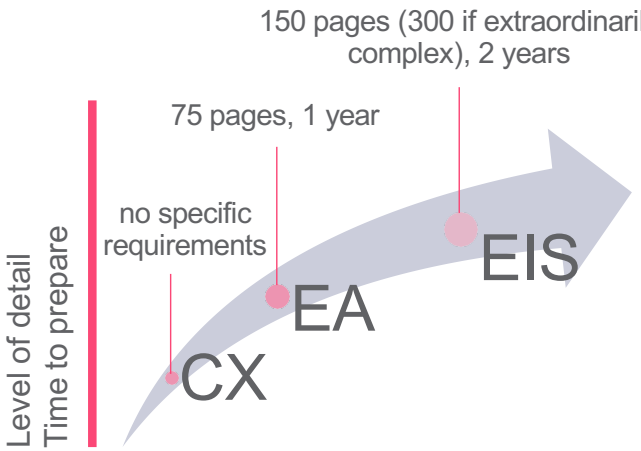
- The purpose of integrating the NEPA process and other environmental requirements is to:
  - Ensure consideration of the full spectrum of requirements during the decision-making process
  - Eliminate delay and duplication of effort
  - Emphasize cooperative consultation among agencies during the development of a proposal

Federal Permitting Dashboard



Timelines by Document Type

Regulatory Requirements



Source of regulatory requirements: 40 CFR 1501.10

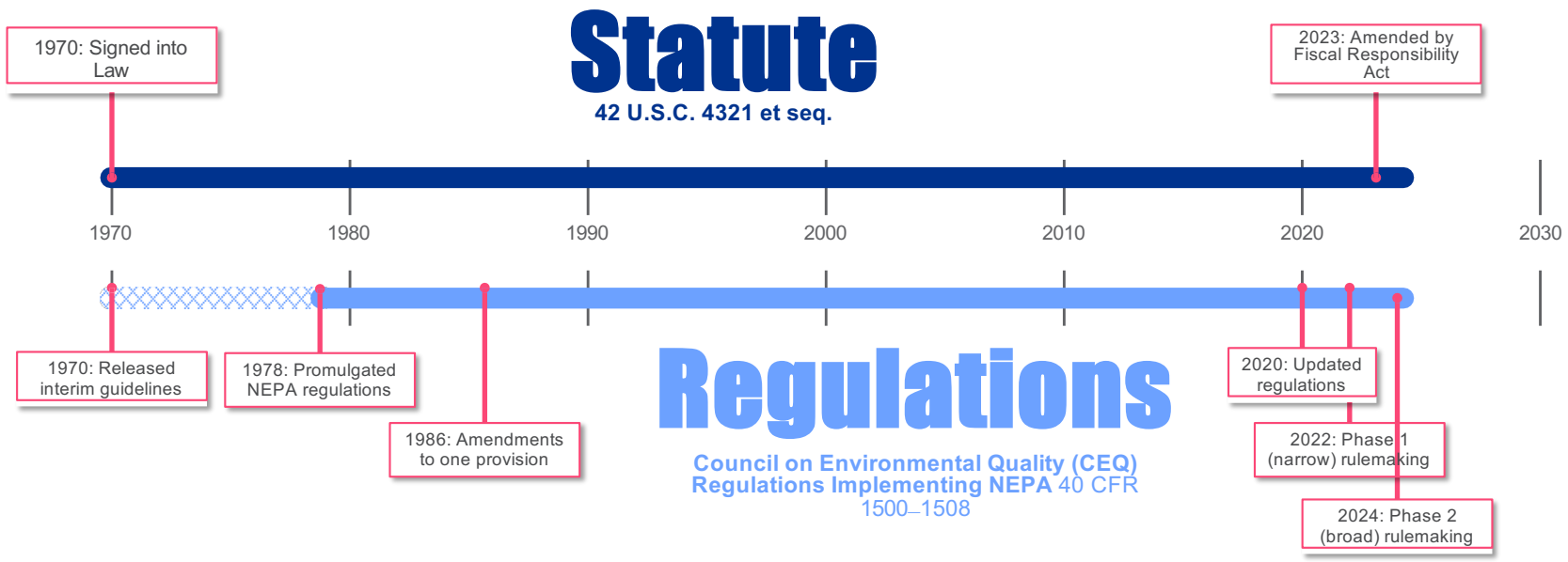
Note: Page limits exclude citations, appendices, and information displayed graphically.

Typical Timelines

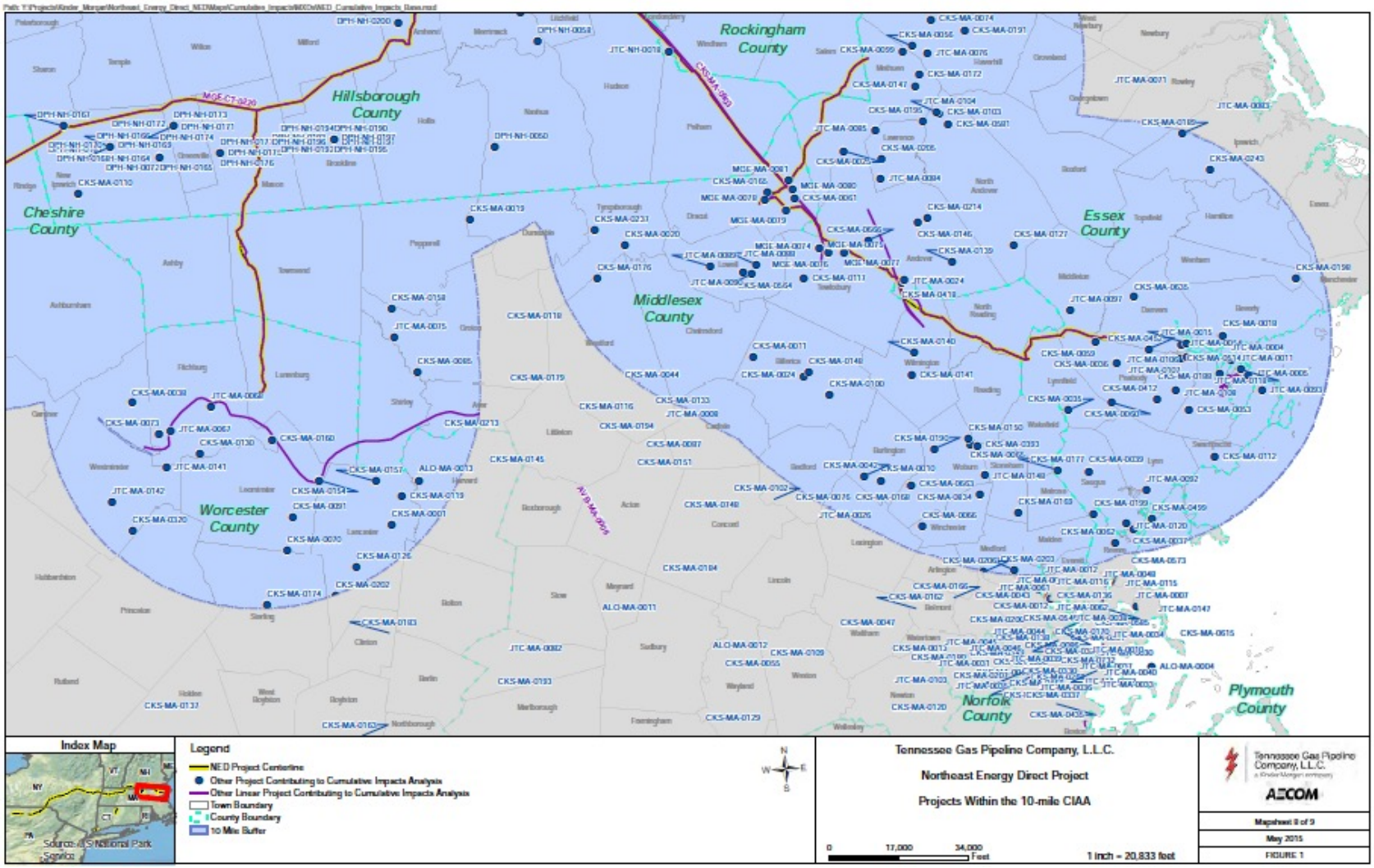
- Actual time needed to complete EAs and EISs varies considerably by agency and specific action, but has historically been substantially greater than required under current regulations

- Timelines are influenced by a multitude of factors, including incomplete applications and inadequate funding and staffing of reviewing agencies

Substantial Changes to NEPA

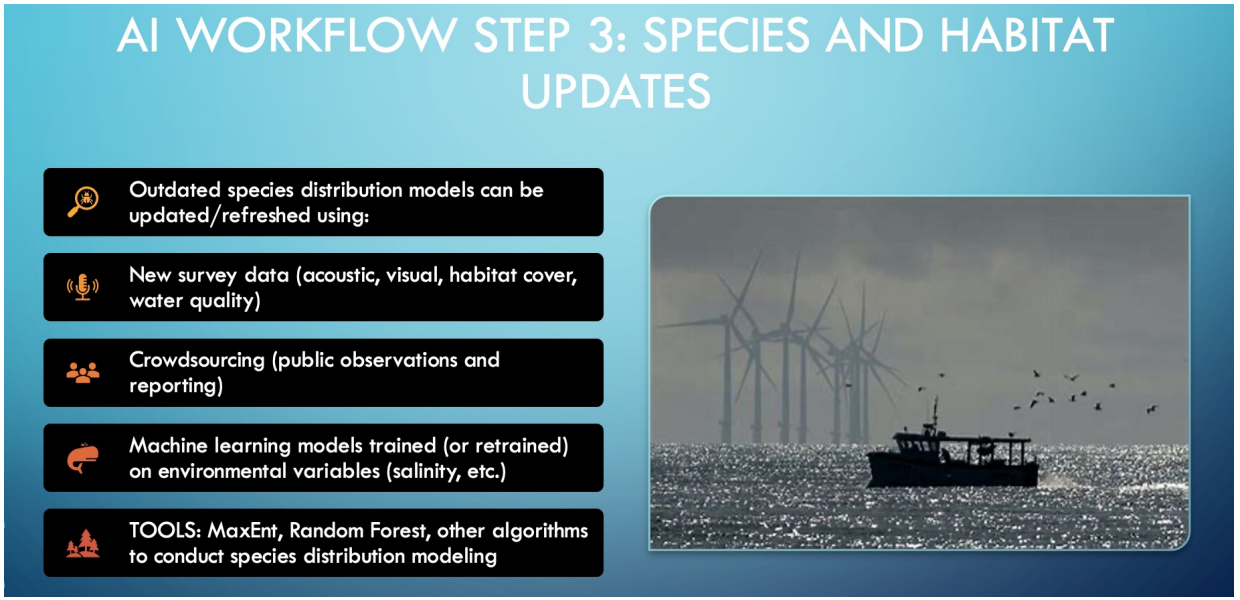


Note: Minor technical and typographical changes not shown.


Rockingham County
Hillsborough County
Cheshire County
Essex County
Middlesex County
Worcester County
Norfolk County
Plymouth County
Index Map
Legend
NED Project Centerline
Other Project Contributing to Cumulative Impacts Analysis
Other Linear Project Contributing to Cumulative Impacts Analysis
Town Boundary
County Boundary
10 Mile Buffer
Source: ESRI National Park Service
Tennessee Gas Pipeline Company, L.L.C.
Northeast Energy Direct Project
Projects Within the 10-mile CIAA
0
17,000
34,000
Feet
1 inch = 20,833 feet
Tennessee Gas Pipeline Company, L.L.C.
AECOM
Map sheet 8 of 9
May 2015
FIGURE 1

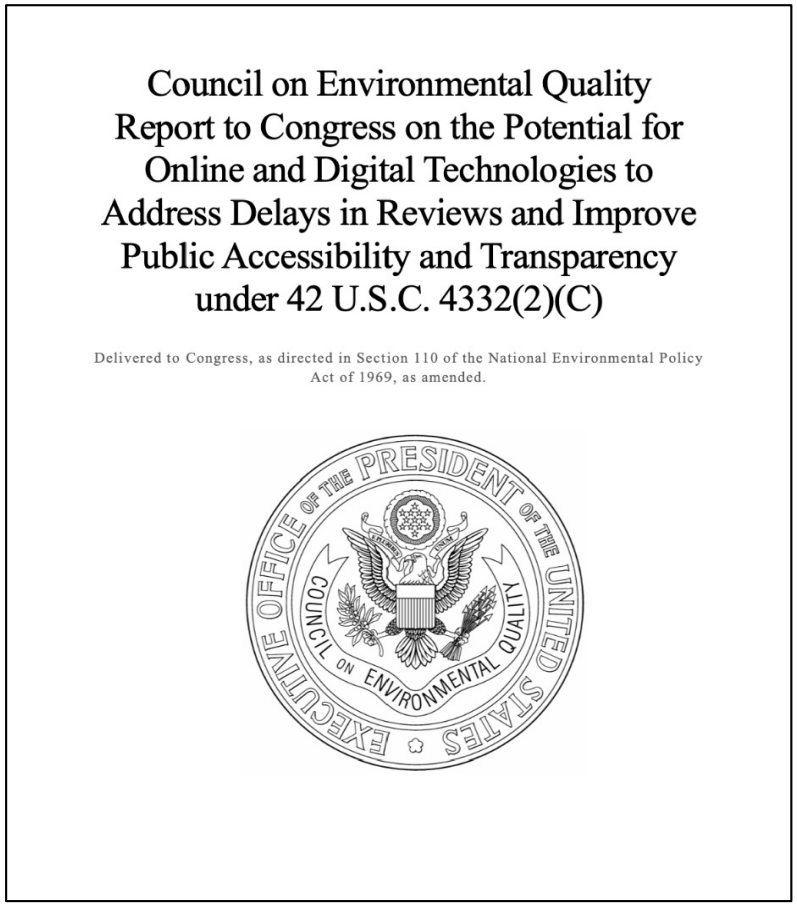
Use of Digital Tools/Technology for NEPA Assessments

- Data collection
- Permit issuance
- Surveys
- Impact assessment/analysis?
- Public comment processing
- Post-approval monitoring



Use of Digital Tools/Technology for NEPA

Permitting Council – 2024 $30M USD investment in technology tool development



Council on Environmental Quality
Report to Congress on the Potential for Online and Digital Technologies to Address Delays in Reviews and Improve Public Accessibility and Transparency under 42 U.S.C. 4332(2)(C)

Delivered to Congress, as directed in Section 110 of the National Environmental Policy Act of 1969, as amended.

Permitting Council

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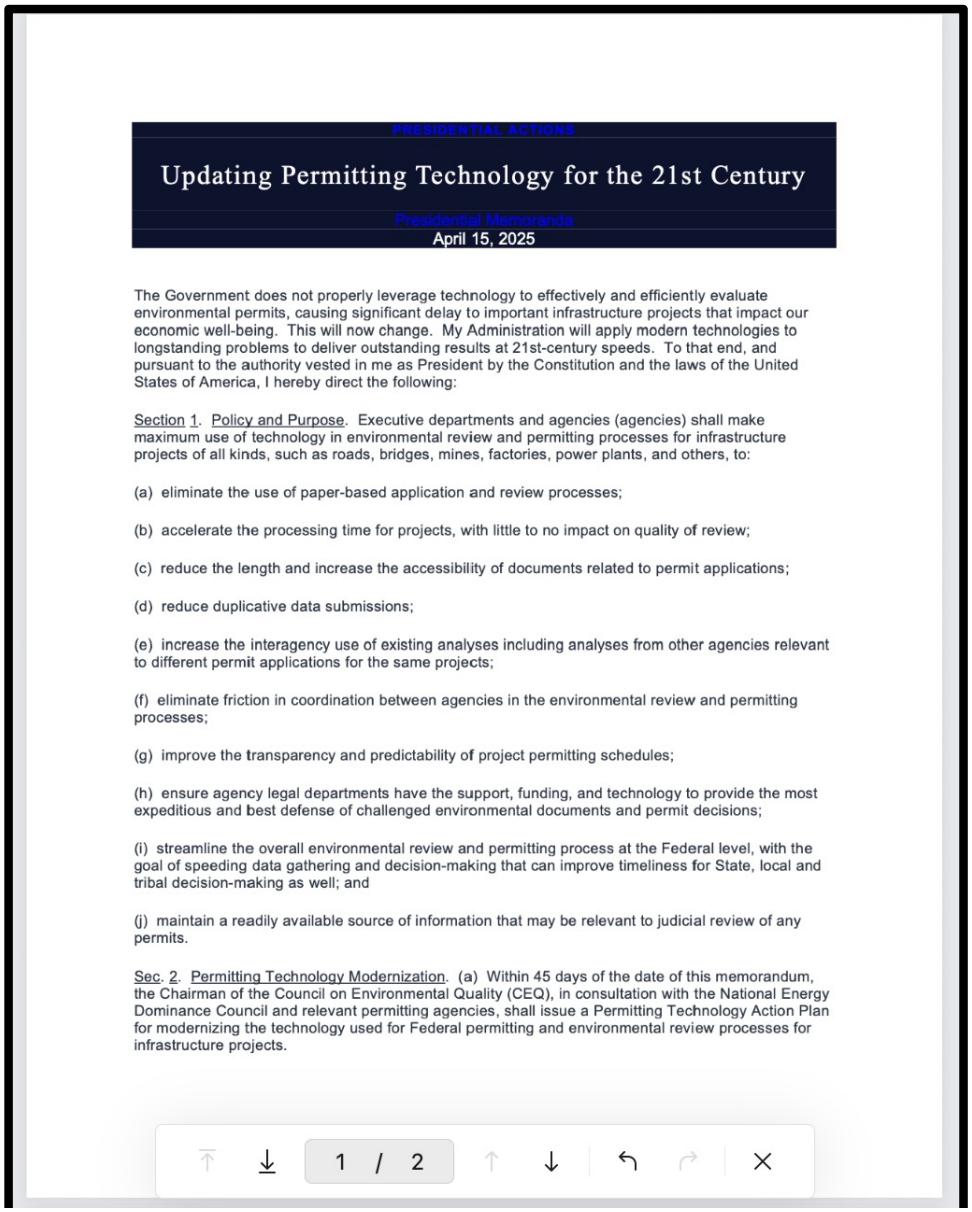
Use of Digital Tools/Technology for NEPA



PRESIDENTIAL ACTIONS

Updating Permitting Technology for the 21st Century

Presidential Memoranda

April 15, 2025

The Government does not properly leverage technology to effectively and efficiently evaluate environmental permits, causing significant delay to important infrastructure projects that impact our economic well-being. This will now change. My Administration will apply modern technologies to longstanding problems to deliver outstanding results at 21st-century speeds. To that end, and pursuant to the authority vested in me as President by the Constitution and the laws of the United States of America, I hereby direct the following:

Section 1. Policy and Purpose. Executive departments and agencies (agencies) shall make maximum use of technology in environmental review and permitting processes for infrastructure projects of all kinds, such as roads, bridges, mines, factories, power plants, and others, to:

(a) eliminate the use of paper-based application and review processes;

(b) accelerate the processing time for projects, with little to no impact on quality of review;

(c) reduce the length and increase the accessibility of documents related to permit applications;

(d) reduce duplicative data submissions;

(e) increase the interagency use of existing analyses including analyses from other agencies relevant to different permit applications for the same projects;

(f) eliminate friction in coordination between agencies in the environmental review and permitting processes;

(g) improve the transparency and predictability of project permitting schedules;

(h) ensure agency legal departments have the support, funding, and technology to provide the most expeditious and best defense of challenged environmental documents and permit decisions;

(i) streamline the overall environmental review and permitting process at the Federal level, with the goal of speeding data gathering and decision-making that can improve timeliness for State, local and tribal decision-making as well; and

(j) maintain a readily available source of information that may be relevant to judicial review of any permits.

Sec. 2. Permitting Technology Modernization. (a) Within 45 days of the date of this memorandum, the Chairman of the Council on Environmental Quality (CEQ), in consultation with the National Energy Dominance Council and relevant permitting agencies, shall issue a Permitting Technology Action Plan for modernizing the technology used for Federal permitting and environmental review processes for infrastructure projects.

1 / 2

NEPATEC1.0 Project

- Existing online repositories containing EISs and other NEPA documents are incomplete and have limited search capabilities
- EISs are long documents that do not have a universally consistent or standardized structure
- AI can assist people involved in the preparation and review of NEPA documents and enhance efficiency by:
  - searching for, interpreting, and synthesizing content from existing NEPA documents
  - assessing trends in NEPA documents and processes over time
  - generating draft content or reviewing text of new NEPA documents
  - assisting with analysis and summarization of public comments

NEPATEC1.0 Project

- Scraped a total of **35,427** PDFs from the EPA website from **12,376** EIS Project Links
- Total of **16,310** EIS Project Metadata
- 2-step EIS Project Title merging:
  - Duplicate Title Merging
  - Fuzzy Title Merging
- After mapping the PDFs to corresponding metadata, total of **28,212** PDFs from **2,917** Unique EIS Projects
  - Total number of pages: **4.5 Million**
  - Total number of tokens (GPT2 tokenizer): **3.6 Billion**

3K Projects

28K PDFs

4.5M Pages

3.6B Tokens

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Technical Opportunities, Users, and Solutions

Problems, ways solutions would benefit potential users (high-level stakeholders, researchers/authors of EISs, and members of the public), and examples of potential solutions.

- **NEPA documents often contain technical jargon and are challenging for the public to understand.**
  - Need: Apply language modeling to suggest revisions to NEPA documents to improve clarify through use of plain text (e.g., clear, understandable prose)
  - Solutions:
    - ✓ Develop AI-powered tools for enhancing document clarity and readability.
    - ✓ Implement a plain language checker and recommendation for NEPA documents.

- **High-Level Stakeholders:** Ensures documents meet policy and regulatory standards.
- **Researchers:** Helps in producing clear and concise research outputs.
- **General Public:** Improves document readability and comprehension.

Technical Complexity Level

- **Reviewing and synthesizing information from multiple NEPA documents is time consuming.**
  - Need: Enable rapid comparative analysis and summarization of multiple NEPA documents.
  - Solutions:
    - ✓ Develop natural language processing algorithms to summarize documents.
    - ✓ Create a comparative analysis tool for multiple NEPA documents.

- **High-Level Stakeholders:** Provides quick insights for decision-making.
- **Researchers:** Assists in comparative studies across multiple documents.
- **General Public:** Simplifies complex information for better understanding.

Technical Complexity Level

Technical Opportunities, Users, and Solutions (Continued)

- **NEPA documents are information rich but have limited to no metadata.**
  - Need: Extract multi-level metadata to facilitate information retrieval and analysis by LLMs.
  - Solutions:
    - ✓ Develop software to reliably harvest metadata from a variety of file types (PDFs, Word documents, etc.)
    - ✓ Implement a metadata standardization system to ensure consistency across data sets.

- **High-Level Stakeholders:** Helps in policy-making and oversight.
- **Researchers:** Aids in academic and practical research.
- **General Public:** Assists in understanding project context and relevance.

Technical Complexity Level

- **How do NEPA projects and processes change with place and time?**
  - Need: Find documents or assess spatio-temporal trends based on project location and points in time.
  - Solutions:
    - ✓ Create visualization tools for spatio-temporal data analysis.
    - ✓ Develop machine learning models to predict trends based on historical data.

- **High-Level Stakeholders:** Enables strategic planning based on spatial and temporal trends.
- **Researchers:** Aids in identifying patterns and anomalies over time.
- **General Public:** Enhances public awareness of environmental changes.

Technical Complexity Level

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Technical Opportunities, Users, and Solutions (Continued)

- **NEPA documents are mostly text and not designed to convey information quickly or visually.**
  - Need: Display specific subsets of information graphically to enhance understanding (e.g., word cloud, complex numerical taxonomic clustering).
  - Solutions:
    - ✓ Develop dynamic visual tools like word clouds and taxonomic clustering.
    - ✓ Create dashboards for visual representation of complex data sets.

- **High-Level Stakeholders:** Assists in data-driven decision-making.
- **Researchers:** Helps to visually interpret complex data patterns.
- **General Public:** Makes technical information accessible through visuals.

Technical Complexity Level

- **Few quantitative metrics are available to measure the efficiency of the NEPA process.**
  - Need: Assess trends in document length, process length, project types, and other characteristics over time.
  - Solutions:
    - ✓ Develop tools to track document length, process duration, and other efficiency metrics.
    - ✓ Implement dashboards for real-time monitoring of NEPA efficiency.

- **High-Level Stakeholders:** Informs policy reviews and legislative changes.
- **Researchers:** Supports empirical studies and trend analysis.
- **General Public:** Offers transparency in governmental processes.

Technical Complexity Level

Technical Opportunities, Users, and Solutions (Continued)

- **Geospatial information is not directly embedded in NEPA documents.**
  - Need: Extract detailed project location data to enable geographical search and localization capabilities.
  - Solutions:
    - ✓ Create a geographic information system (GIS) integration module.
    - ✓ Develop APIs to extract and standardize location data from NEPA documents.

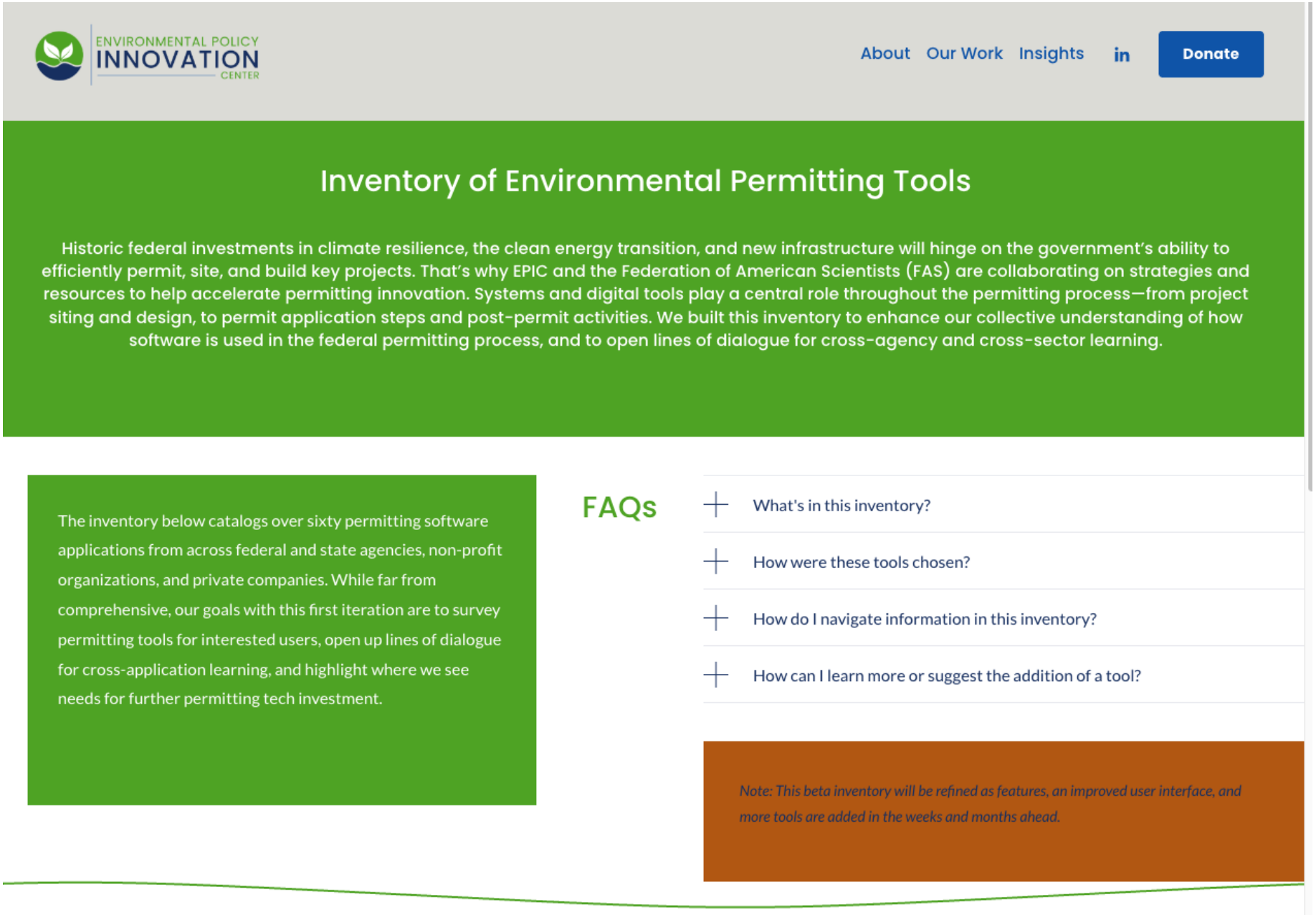
  - **High-Level Stakeholders:** Enhances geographical planning and resource allocation.
  - **Researchers:** Facilitates spatial analysis and correlation studies.
  - **General Public:** Provides an easy way to identify projects in their vicinity.

Technical Complexity Level

- **Are NEPA documents using best available science?**
  - Need: Identify and assess trends in scientific concepts and studies cited in NEPA documents over time and space
  - Solutions:
    - ✓ Develop text mining and analysis tools to identify key scientific concepts.
    - ✓ Implement trend analysis modules for scientific studies cited in NEPA documents.

  - **High-Level Stakeholders:** Informs evidence-based policy-making.
  - **Researchers:** Enables trend analysis in scientific research.
  - **General Public:** Promotes awareness of the scientific foundations of projects.

Technical Complexity Level



https://www.policyinnovation.org/permitting/inventory

ENVIRONMENTAL POLICY INNOVATION CENTER

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NEPAssist

Description
Draws environmental data from Environmental Protection Agency (EPA) Geographic Information System (GIS) databases and web services to ...

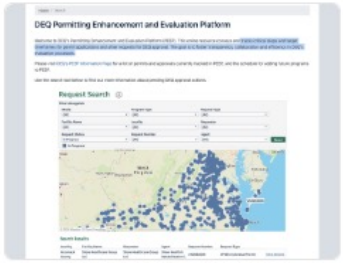
URL
https://www.epa.gov/nepa/nepassist

Entity
Environmental Protection Agency

Bureau
All Bureaus

Stage
Siting & Design

Publicly Available
Yes



PEEP - Permitting Enhanceme...

Description
Tracks steps and target timeframes for permit applications and other requests for the State of Virginia's Department of Environmental Quality (DEQ) ...

URL
https://portal.deq.virginia.gov/peep-s...

Entity
Virgina

Bureau
Virginia Department of Environmen...

Stage
Permit

Publicly Available
Yes

Digital Infrastructure Twin

Description
AI-generated image and video tool for envisioning site-specific infrastructure projects. It can be used for siting and public comment processes to better ...

URL
https://www.bentley.com/software/inf...

Entity
Bentley Systems

Bureau
N/A

Stage
Permit

Publicly Available
Contract basis

NEPAccess

Description
Document search capability, using AI, for all agencies' Environmental Impact Statements (EISs) from between 2012-2022. Database is continually being ...

URL
https://www.nepaccess.org/

Entity
University of Arizona

Bureau
N/A

Stage
Siting & Design

Publicly Available
Contract basis

https://www.policyinnovation.org/permitting/inventory

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U.S. States Use of A.I.

- Permitting processes
  - Produce staff report with compliance history, public comments, and media reports
- Public comment processing
- Sorting large data sets for air and water quality and climate modeling
- Sorting from multiple data sets
- Predictive modeling/collating unstructured data
- Addressing holes in staff capacity and hiring/retention challenges

A.I. Accuracy Issues

- Bloomberg News
  - More than three dozen news summaries required corrections from January-March 2025
  - Other errors included incorrect figures, incorrect attribution, and references to the incorrect Presidential election
  - Spokesperson: "Feedback has been positive in general…and we continue to refine the experience."
- Los Angeles Times
  - Article describes KKK as a "race-neutral organization"
  - In response, editors state: "A.I. summaries are meant to complement our journalism, not replace it."

QUESTIONS/DISCUSSION

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