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6/21/2024

# Hydrogen Prospector Database Demo

**An Approach to Evaluating LWR Plant Integration with Hydrogen and Industrial Facilities**

*INL, ANL, and University of Michigan*



# Attendees

**Jason Marcinkoski – DOE Federal Program Manager**

**Richard D. Boardman – FPOG Pathway Lead**  
**Todd Knighton – Principal Investigator**

## **Team**

**Maria A. Herrera Diaz**  
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**Neeraj C. Hanumante**  
**Kevin Daley**  
**Craig Primer**

# Agenda

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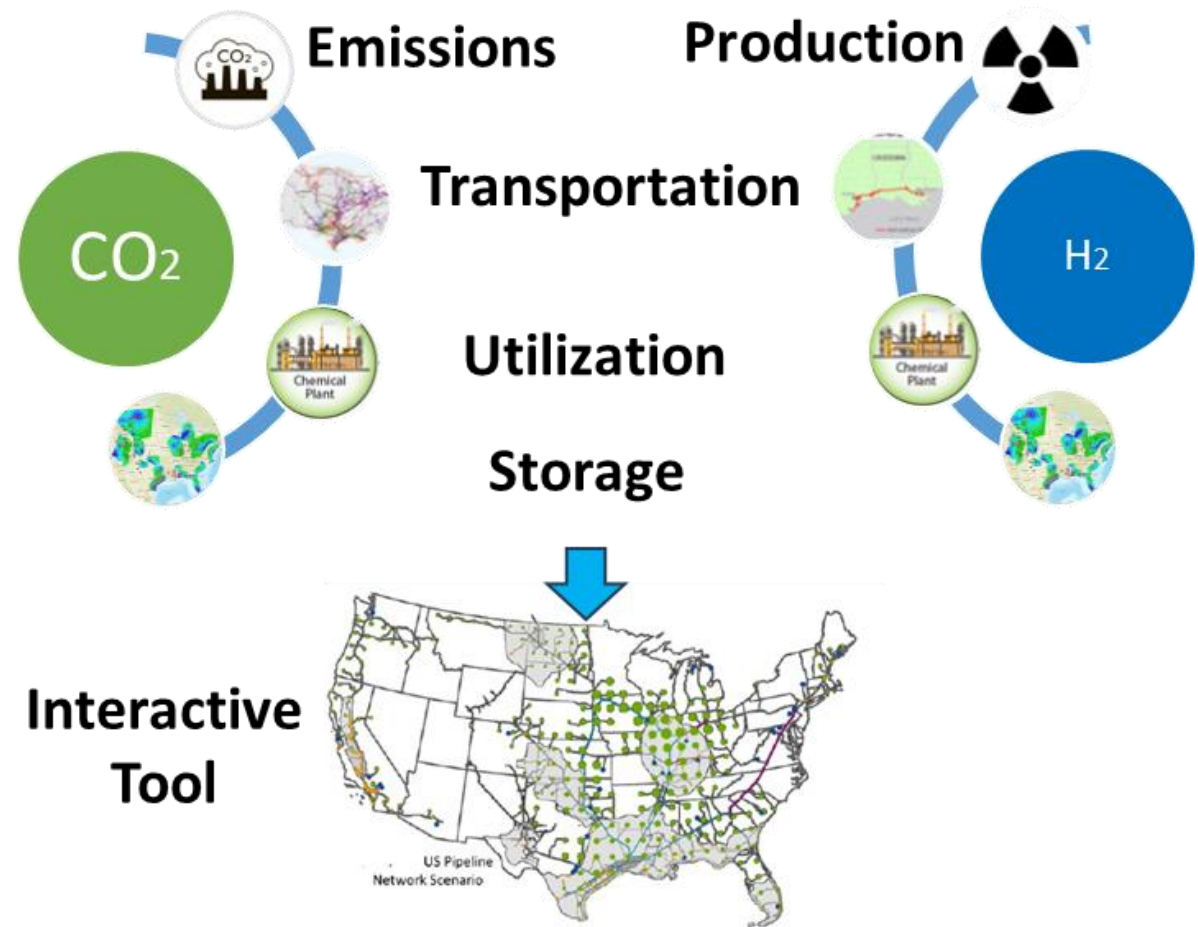
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Future Work

# Background

Assessing opportunities for hydrogen and carbon dioxide capture, transport, utilization, and storage infrastructure is vital for meeting current and future energy and industrial sector demand needs to reach net-zero.



# Goals and Objectives

## Current and future needs of CO<sub>2</sub> and H<sub>2</sub> infrastructure Close to the LWR

Evaluate the current capacity, project the future infrastructure



## Future Work: Cost and Business Case Analysis

Define potential business cases and estimate their economic feasibility and business cases for different systems of carbon and hydrogen



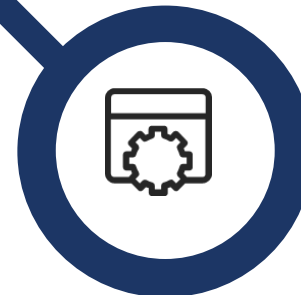
## Demonstration

Evaluate 3 scenarios to analyze hydrogen production opportunities



## Tool Development for Infrastructure Mapping

Develop a database which provides useful output for decision makers evaluating opportunities for nuclear integrated hydrogen production



# Project Timeline

Milestone Category	Title	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Status
M4	Complete a Plan for a data base approach to evaluating LWR plants for coupling with a hydrogen plant and other industrial plants													Completed
M4	Complete Incorporation of carbon resource(s) supply options													Completed
M3	Complete a demonstration of a prospector database to evaluate and select the leading top five opportunities for LWR hydrogen plant													Work in Progress
M2	Provide public release data base for use by utilities to investigate hydrogen production and local-specific markets													Work in Progress

# Prospector Tool Dashboard (in progress)

**HYDROGEN PROSPECTOR**

Overview Plant Insights Data Download

### Potential Hydrogen Demand Around Existing LWRs

» Methodology ⓘ

» Regions

East Coast  Gulf Coast  West Coast, AK, HI  
 Midwest  Rocky Mountain

» Distance Radius (mi)  10  20  50  100

» Facility Types ⓘ

Tier 1  Ammonia  DRI  FCEV  
 Refinery  Natural Gas Electric  Syngas : Ethanol

Tier 2  DRI  FCEV  
 Natural Gas Electric  Syngas : Ethanol

Tier 3  FCEV  
 Syngas : Ethanol

» Visualizations:

**Total H2 Demand at 50 Mile Buffer by Specified Facilities and Demand Type**

Facility Name	Total H2 Demand at 50 Miles (Approx.)
Arkansas Nuclear One	100
Beaver Valley	150
Inlandwood Generation Station	200
Browns Ferry	100
Brunswick Nuclear	100
Byron Generating Station	100
Callaway	100
Fort Cliffs Nuclear Power Plant	100
Calantha	100
Clinton Power Station	350
Columbia Generating Station	100
Comanche Peak	100
Cooper Nuclear Station	100
Davis Besse	300
Diablo Canyon	100
Donald C Cook	100
Dresden Generating Station	200
Edwin I Hatch	100
Permi	500
Grand Gulf	100
H B Robinson	100
Harris	100
James A Fitzpatrick	100
Joseph M Farley	100

**HYDROGEN PROSPECTOR**

Overview Plant Insights Data Download

dropdown for sites

Distance radius (mi): 0 20 50 100

- C02
- Storage
- Potential Hydrogen Demand
- Biomass Availability
- Location of Other Industries
- Reference Layers

**Key**

- description 1
- description 2
- description 3



# Infrastructure & Demand Data Compilation

- Potential hydrogen demand estimates

**Tier 1:** Existing facility and users

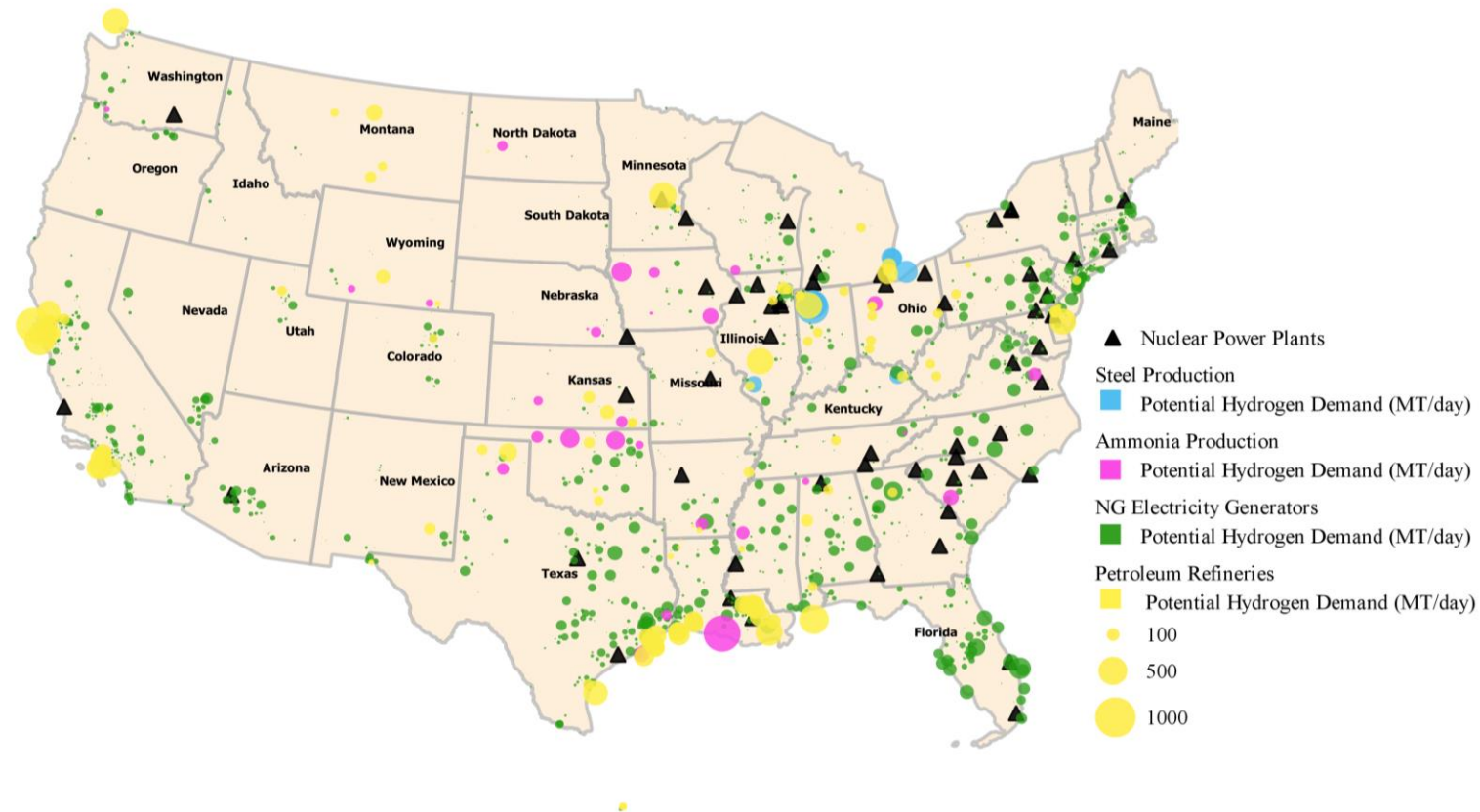
-Refineries and ammonia

**Tier 2:** Existing facility and potential user

-H<sub>2</sub> Blending for NG Electricity Generators, Steel Production

**Tier 3:** Future industries

-E-Fuels etc.

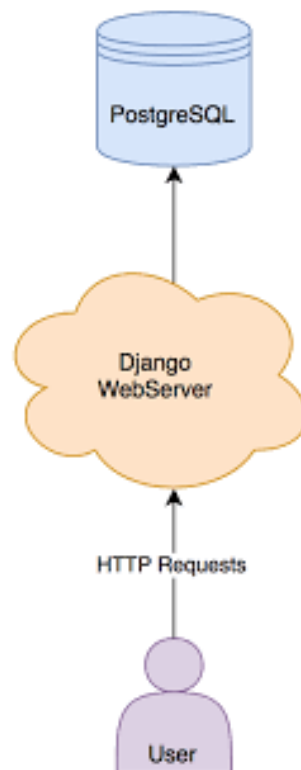




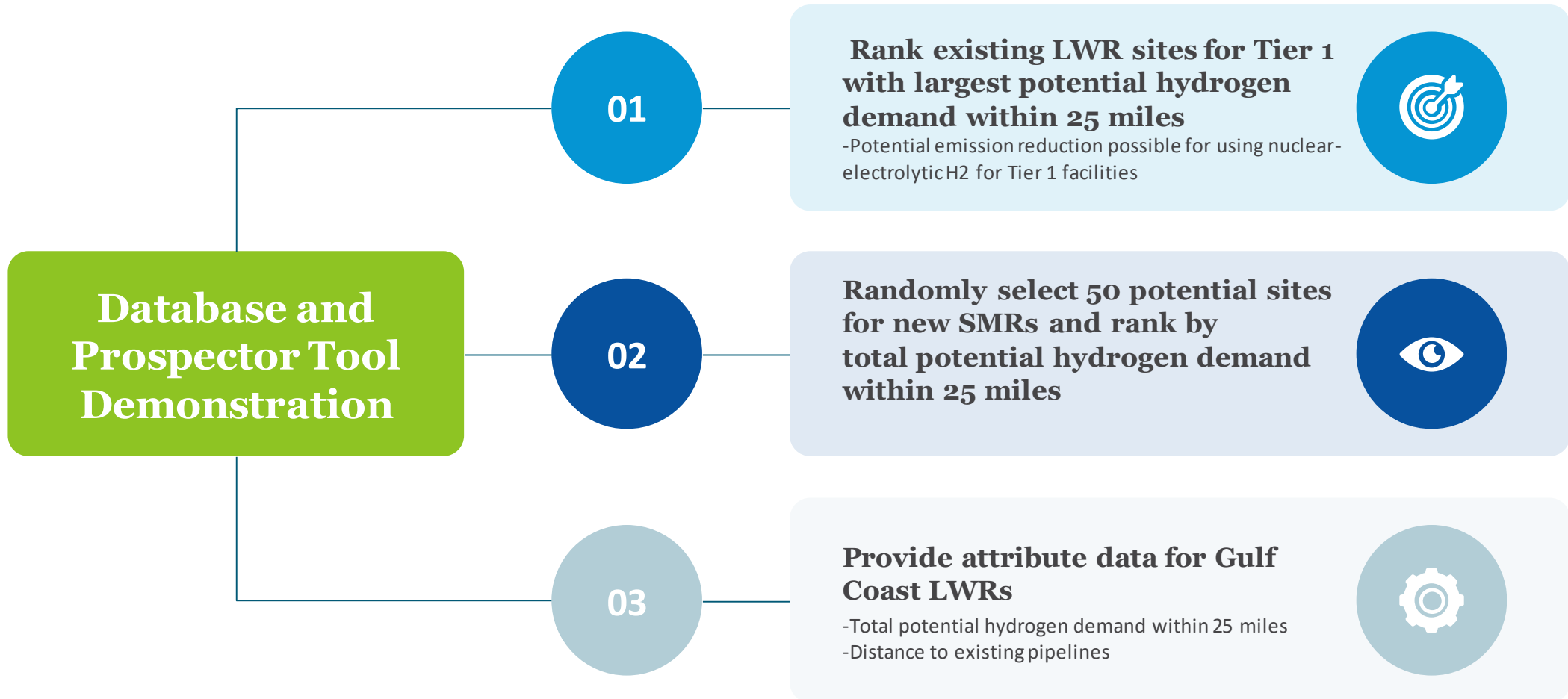
# Infrastructure & Demand Data Compilation

- Distance between NPP and closest H<sub>2</sub> and NG pipeline infrastructure
- Location of geological storage: Salt domes/cavern, unused oil and gas well etc.
- CO<sub>2</sub> source, amount, and location

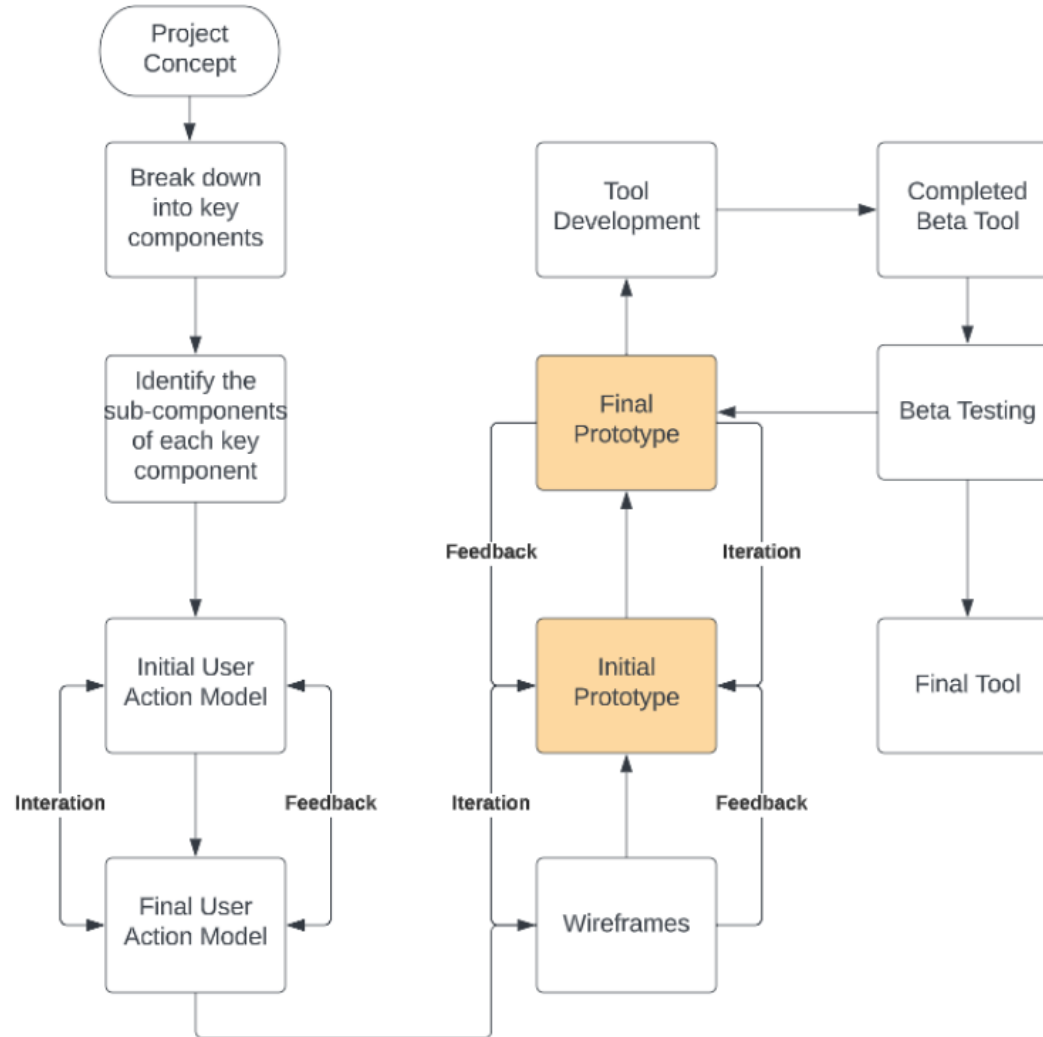
# Database to Application



# Introduction to the Demo~Scenarios



# Development Process



# DEMO

# Application Landing Page

**HYDROGEN  
PROSPECTOR**

Overview

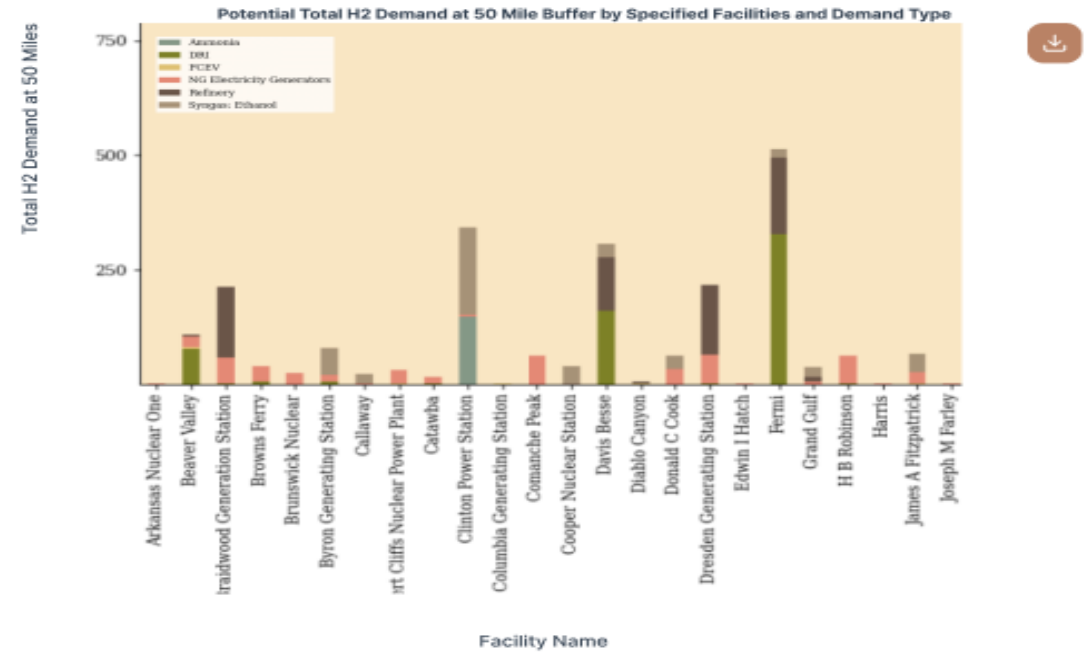
Plant Insights

Data Download

## Potential Hydrogen Demand Around Existing LWRs

- >> [Methodology](#)
- >> **Regions**
  - East Coast
  - Midwest
  - Gulf Coast
  - Rocky Mountain
  - West Coast, AK, HI
- >> **Distance Radius (mi)**
  - 10
  - 20
  - 50
  - 100
- >> **Facility Types**
  - Tier 1
    - Ammonia
    - Refinery
  - Tier 2
    - DRI
    - Natural Gas Electric
  - Tier 3
    - FCEV
    - Syngas : Ethanol
- >> **Visualizations:**

Provides Users a Regional Overview of Hydrogen Demand





## Mapping Component: Overview



# HYDROGEN PROSPECTOR

Overview Plant Insights

dropdown for sites ▾

**C02** ▲

- Emissions by plant
- Transport Costs

**Storage** ▲

- Existing Storage
- Suitable Storage Locations
  - Salt Caverns
  - Saline Aquifers
  - Depleted Oil Reservoir

**Hydrogen** ▾

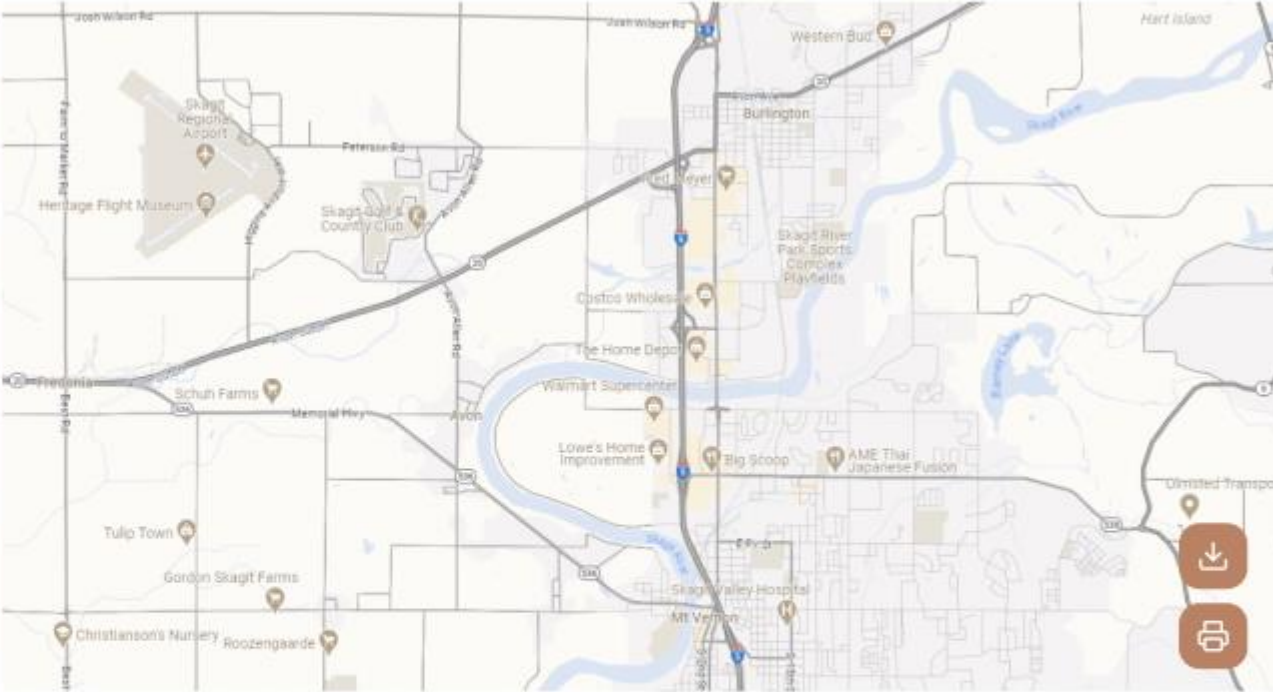
**Biomass Availability** ▾

**Location of Other Industries** ▲

- Iron & Steel
- Refineries
- Paper Mills
- Ammonia Plants

**Reference Layers** ▲

- Transmission Lines
- Substations
- Existing Facilities
- Roads, waterways, rail



Web GIS – Allows users to choose relevant spatial layers (in green), and see the data in the interactive map located on the right side of the tool.

## Data Download



Overview

Plant Insights

Data Download

Select the options below to download:

>> Type of plant:

All Plants  Individual Plant  By Region

>> Format type:

ESRI Shapefile  CSV

Click through each individual dropdown to select what layers to download:

C02	▼
Storage	▼
Potential Hydrogen Demand	▼
Biomass Availability	▼
Location of Other Industries	▼
Reference Layers	▼

Download

Users can download selected data in multiple formats for use in other applications /research.

## FY24 Accomplishments

- M4 Completed (October)- developed a plan for the database
- M4 Completed (April)- data gathering for carbon resources, transport and storage (including biomass)
- M3- data mining for hydrogen and CO2 demand, storage, and transportation infrastructure, demonstration of the database

## FY24 Ongoing Work

- Finalize prototype
- Continue developing new data streams
- Improve modeling capabilities
- Complete tool development
- Complete beta testing
- Release final tool to public

## Future Work

- Geographically expand datasets for full coverage of the US
- Evaluation of synfuels production
- Implement more sophisticated modeling to draw broader conclusions
- Leverage STAND policy components and expand to include policy/incentives around existing LWRs and new hydrogen facilities
- Add risk assessment



# Sustaining National Nuclear Assets

*[lwrs.inl.gov](http://lwrs.inl.gov)*