HyDRA:

Hydrogen Demand and Resource Analysis Tool

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Project ID #AN4

This presentation does not contain any proprietary, confidential, or otherwise restricted information

Overview

Timeline

Project start date – September 2006

Project end date – September 2007

Percent complete – 50% complete

Budget

Total project funding – 100% DOE share

Funding received in FY 2006 – $0 (new project)

Funding for FY 2007 – $305k

Barriers

Systems Analysis Barriers

Stove-piped/siloed analytical capability

Inconsistent data, assumptions, and guidelines

Suite of models and tools

Partners

NREL project with support from *A Mountain Top, LLC* for programming expertise

Objectives

Oregon –
$0.0443/kWh

Develop a web-based GIS tool to allow analysts, decision makers, and general users to view, download, and analyze hydrogen demand, resource, and infrastructure data spatially and dynamically.

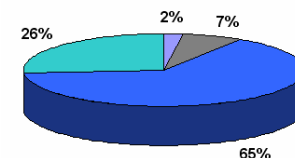Why spatial analysis for hydrogen?

An energy carrier, similar to electricity
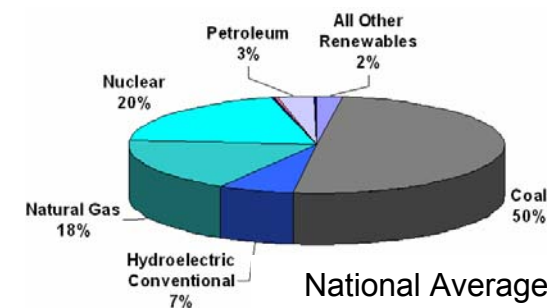
Produced from various feedstocks

Resource, demand, and infrastructure will vary regionally

National Average
Industrial Electricity
Rate = $0.0525/kWh

- Analyses tend to use national averages

- Price and availability are not the national average
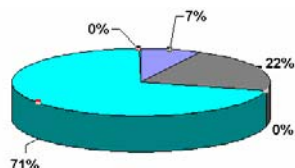
- Need a tool to facilitate regional analyses

Vermont –
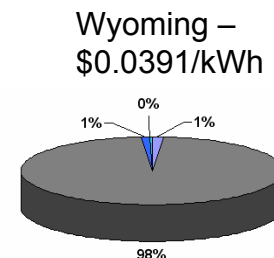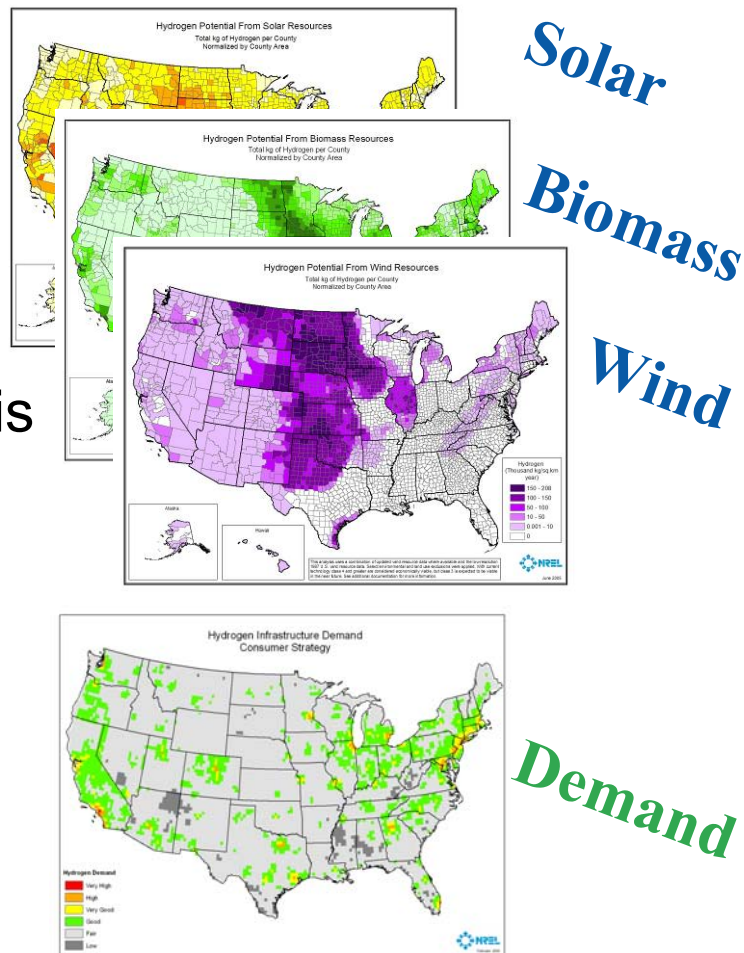$0.0796/kWh

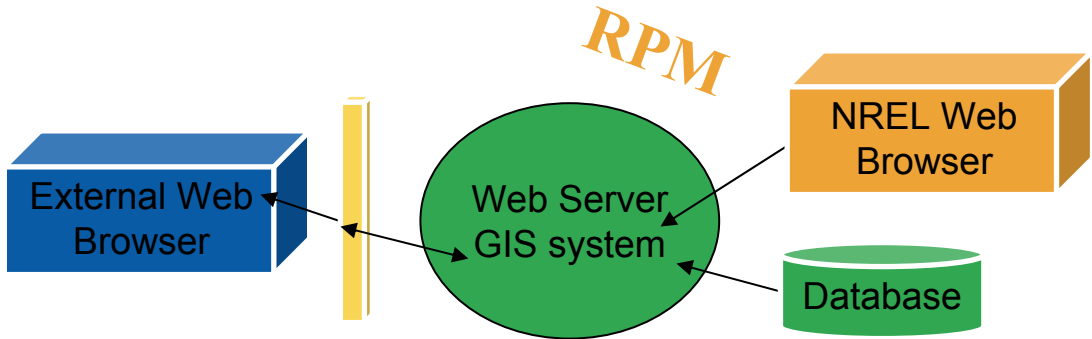**Does not replace other analysis efforts**

Wyoming –
$0.0391/kWh

Approach

Builds on existing NREL efforts

  GIS Resource Analysis

  Hydrogen Demand Scenario Analysis

  Renewable Planning Model (RPM)

Solar

Biomass

Wind

Demand

RPM

External Web Browser

Web Server GIS system

NREL Web Browser

Database

| Functional Requirements | Data Requirements | Application Build and Test | Release 6/2007 (beta) 9/2007 |

Accomplishments – Functional Requirements

1. Generic viewing maps
2. Resource maps
3. Infrastructure maps
4. Demand maps
5. Layer control
6. Change underlying assumptions
7. Build hydrogen system
8. Buffer layers

9. Security
10. Import data
11. Export data
12. Selecting data
13. Print map
14. Emissions
15. Temporal functionality
16. Interaction with other applications

Progress – Resource Data

Renewable
- **Wind**
- **Solar**
- **Biomass**
- Offshore wind
- Hydro
- Geothermal

Coal

Natural gas
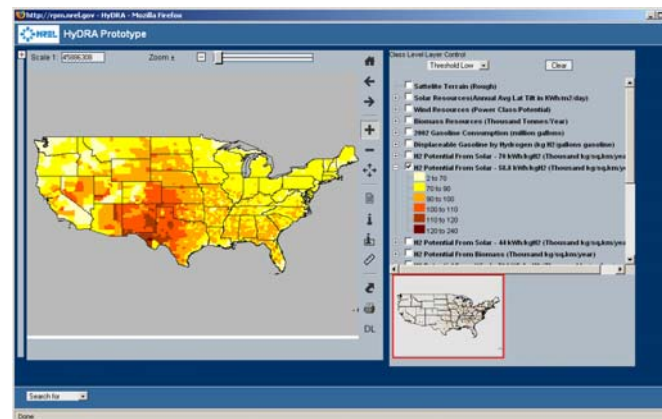
Uranium

Water

Geologic features
- Sequestration locations
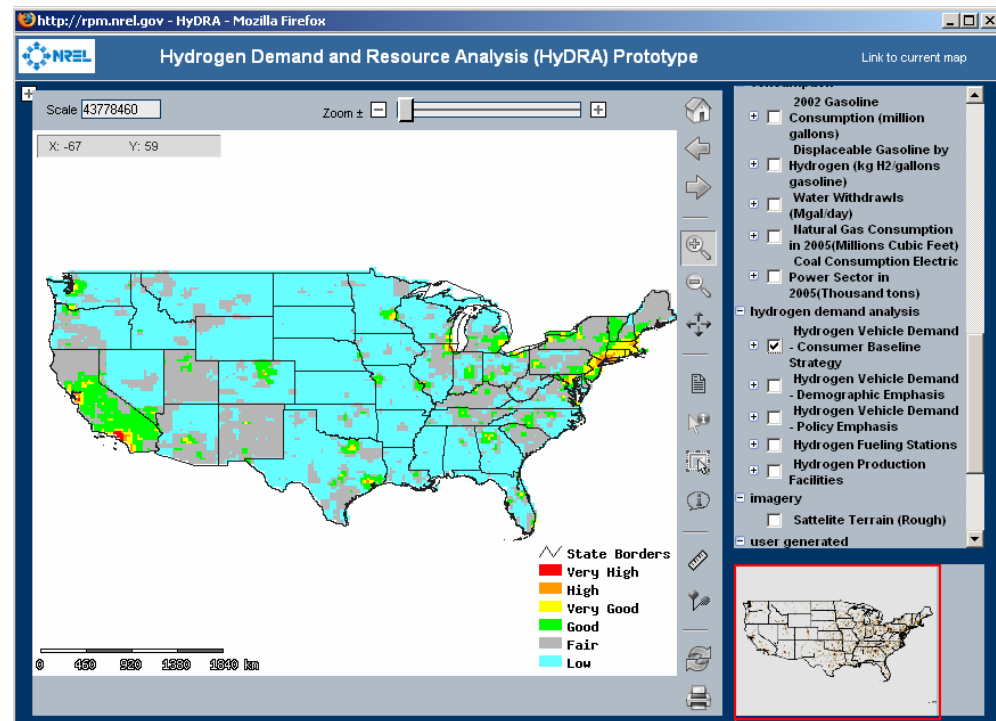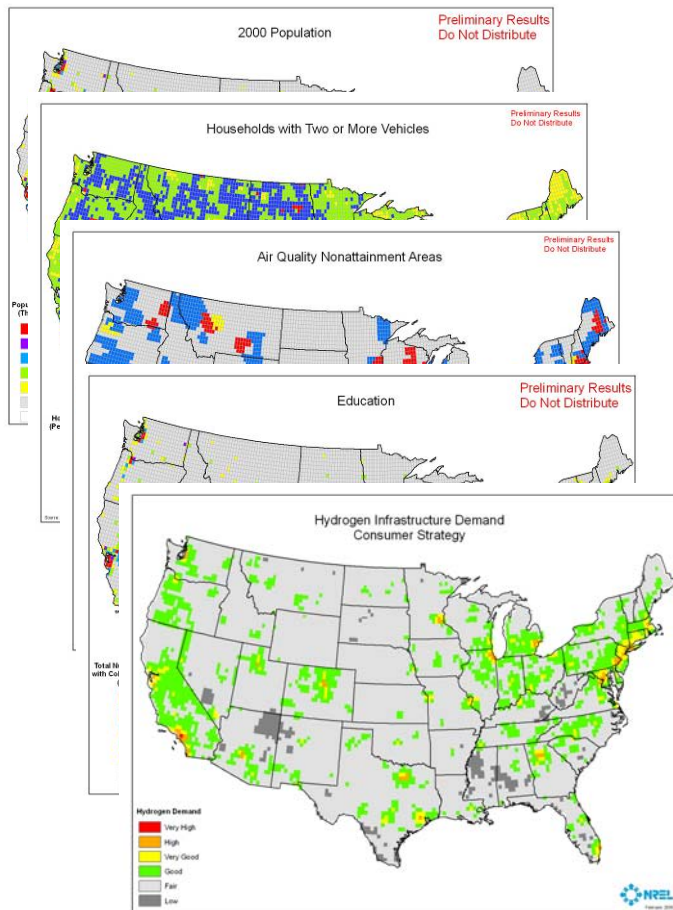- Hydrogen storage

Oil/gasoline

Need energy production potential

Hydrogen production potential

Usage of utilities and feedstocks

Competition

Progress – Demand Data

Identifies key attributes for hydrogen vehicle adoption based on demographics and policy

Progress – Infrastructure Data

Electricity

Natural gas

Water

Capacity

Location

Availability

Consumption

Rates

Water treatment plants

Transportation sector

    Roads

    Rail

    Ports

Hydrogen infrastructure
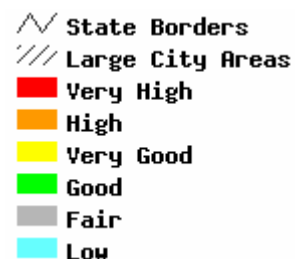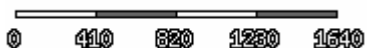
Power plants

Renewable installations

Gas stations

Accomplishments - Application

Incorporate existing analysis work in application

General mapping functionality

-Zoom

-Pan

-Print

-Scale

-Legend

Thresholds

-Single out

-Floor

-Ceiling

Hide/emphasize

Layer maps

Identify/select

Search

Dynamically change assumptions

Security

Accomplishments – Case Study

Where should a biomass-to-hydrogen demonstration project be built?

Requirements:

Good biomass resource
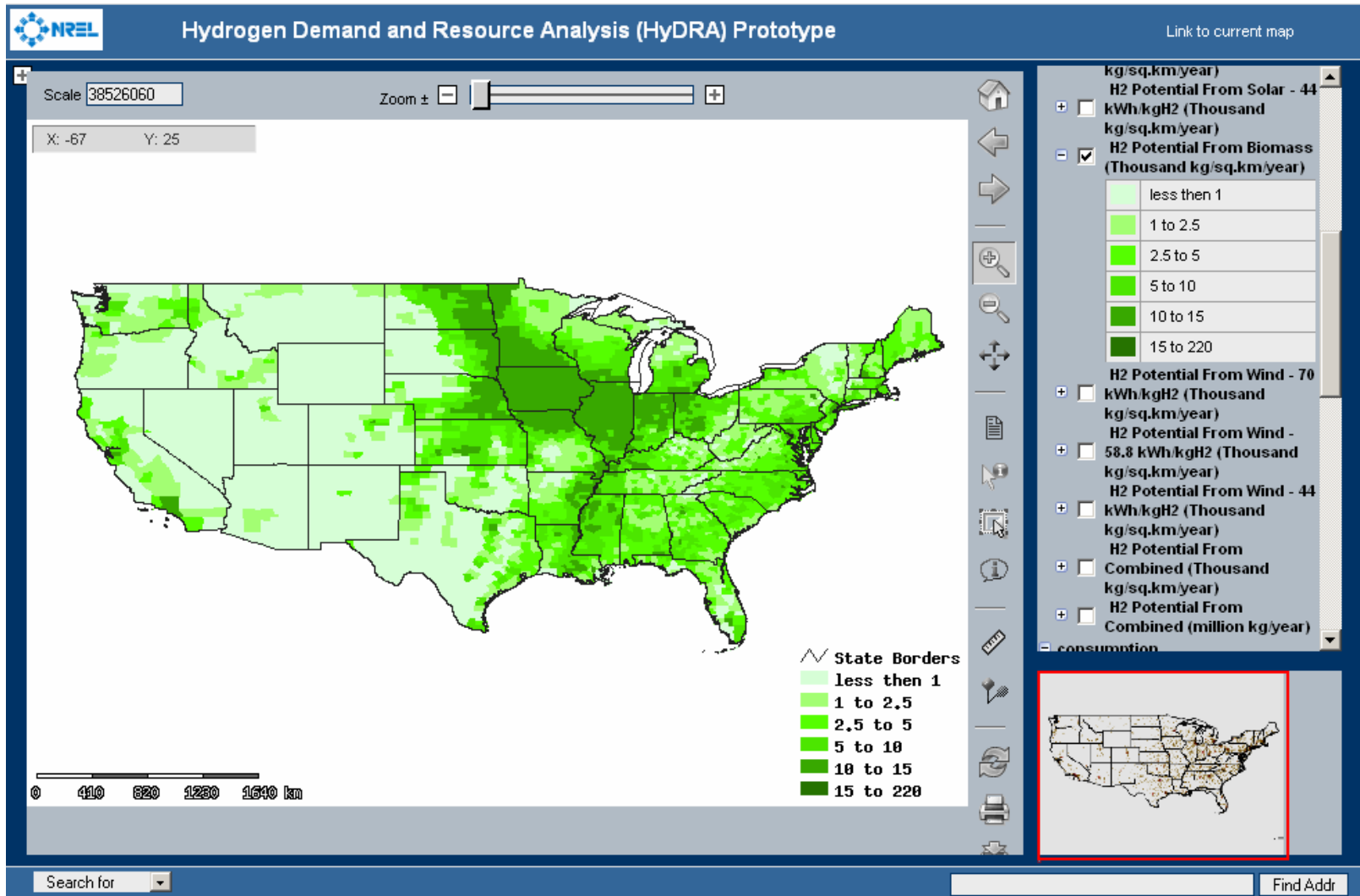
Good early demand
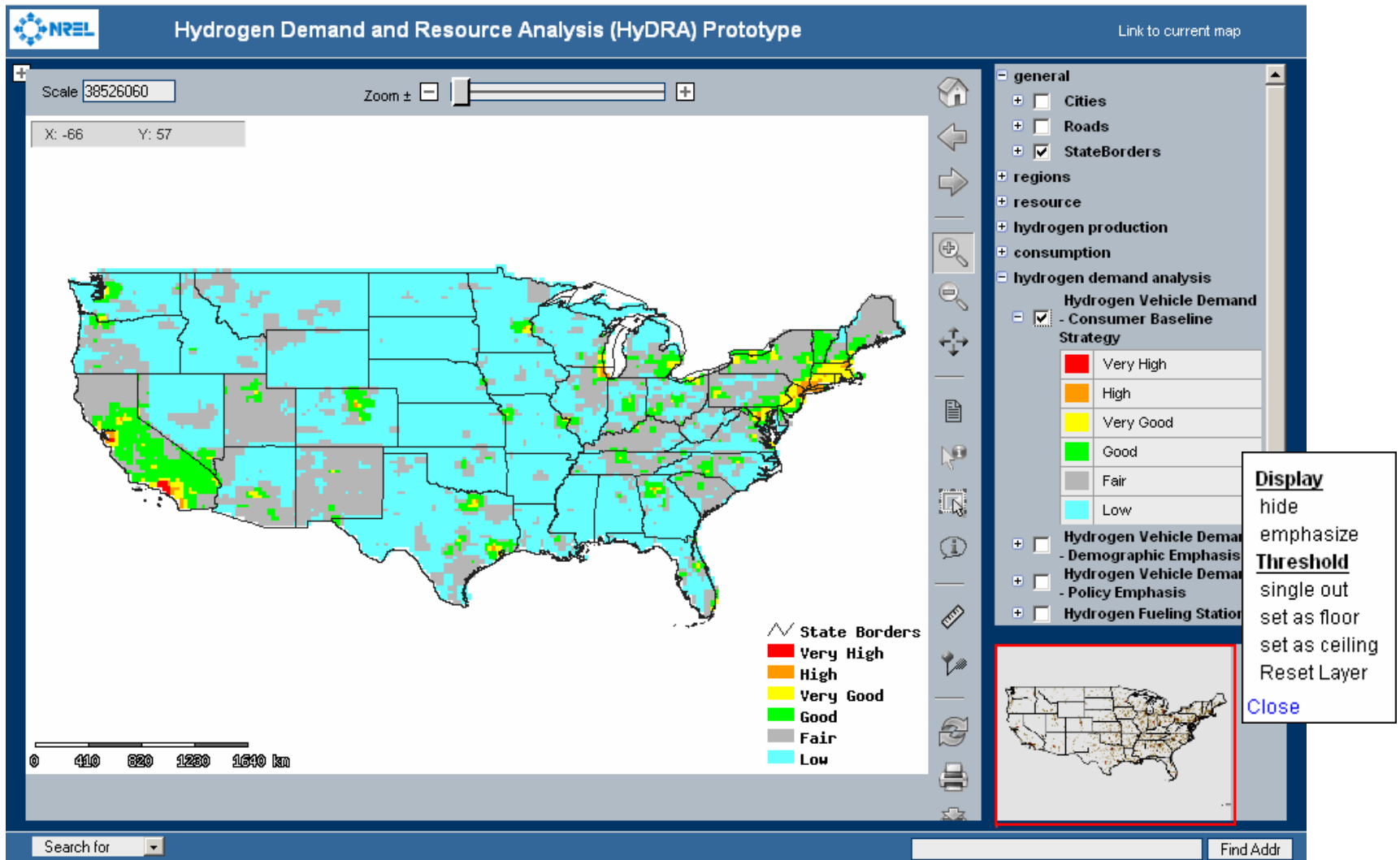
Build first hydrogen refueling station in region

Near existing hydrogen production locations
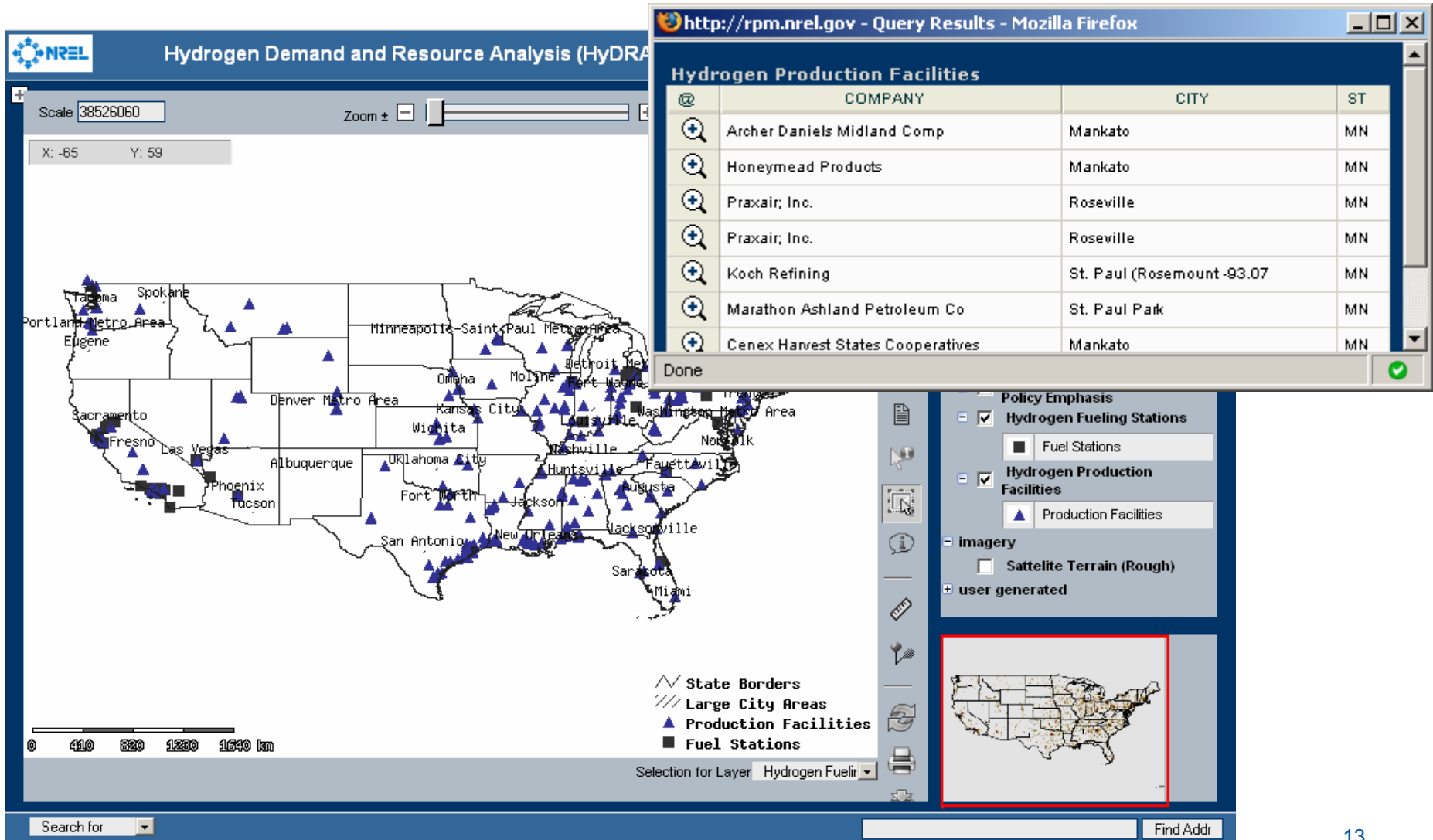
Near a major metropolitan area

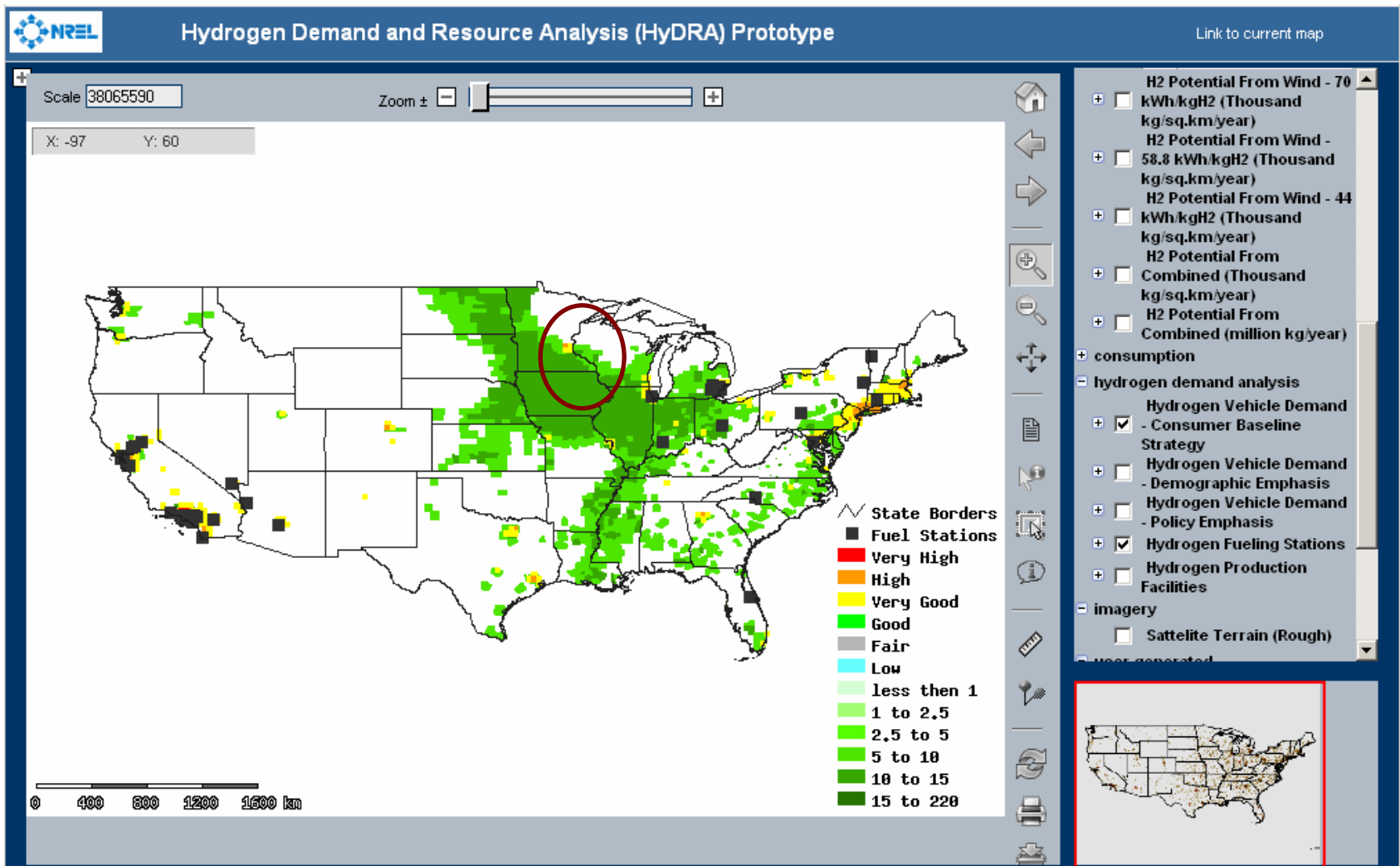# Accomplishments – Good Biomass Resource
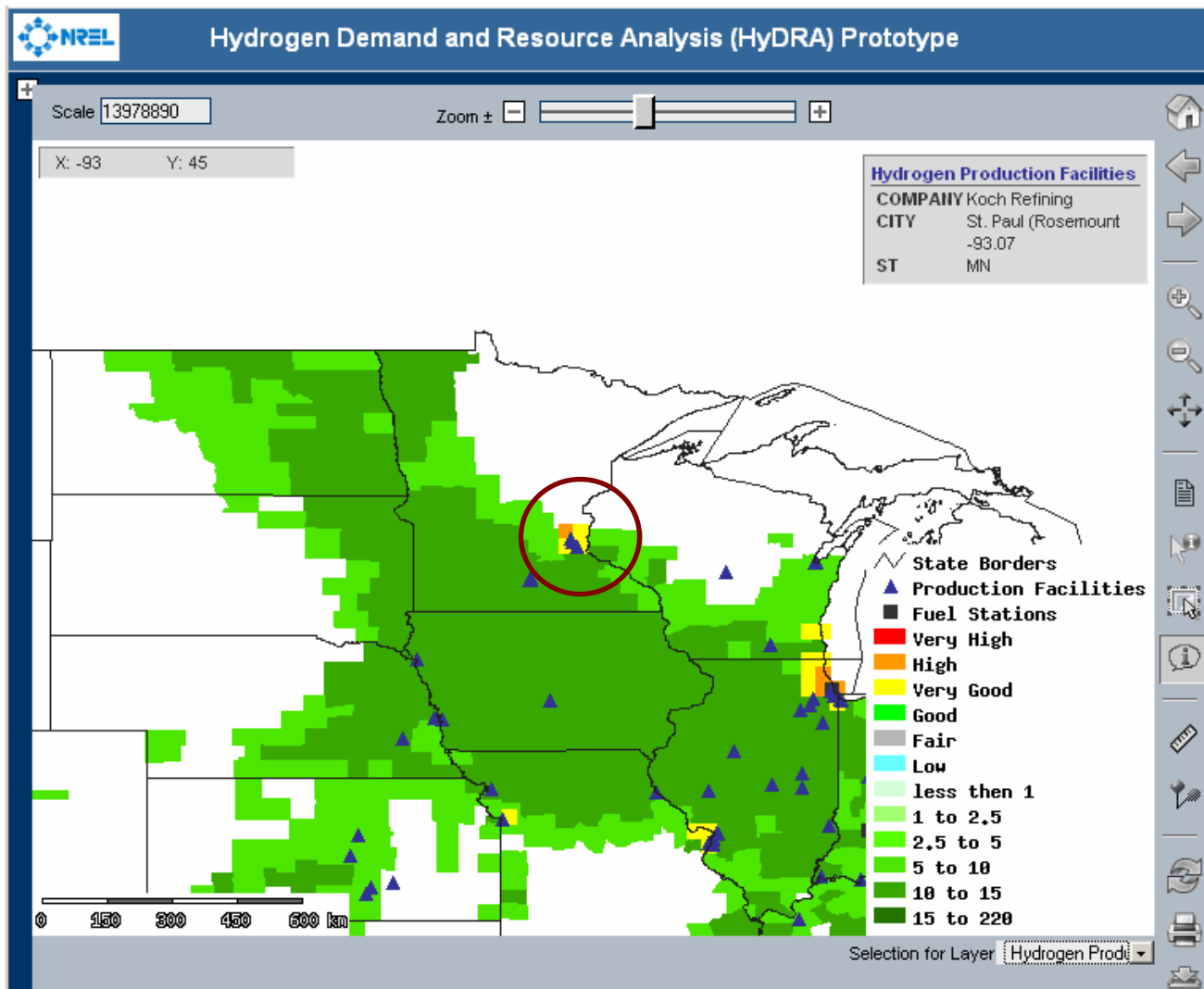
Accomplishments - Good Early Demand

Accomplishments – Refueling Stations and Production Facilities

Accomplishments – Layering Data

Accomplishments – Case Study Findings

Future Work

June 2007: beta release

June – August 2007: Develop release 2

       Additional resource layers

       Infrastructure layers

       Application functionality enhanced

            e.g. upload/download data

September 2007: test and release

FY 2008 and beyond: temporal functionality, interfaces with other applications (MSM, HyDS, HyTrans), additional resource and infrastructure layers, emissions

Summary

HyDRA concept is a Web-based, dynamic, highly interactive demand and resource tool

- View, download, and report on resource, demand, and infrastructure data
- Spatially represent analysis results
- Provides a tool for regional analysis

Current DOE resource and demand analysis is static

Existing DOE models need or could use consistent demand and resource data and regional capabilities

- HyDS, HyTrans, MSM, others

Hydra is built on existing work at NREL

- GIS resource analysis
- Hydrogen demand scenario analysis
- Renewable planning model