Net Zero Labs Pilot

Briefing for ISWG

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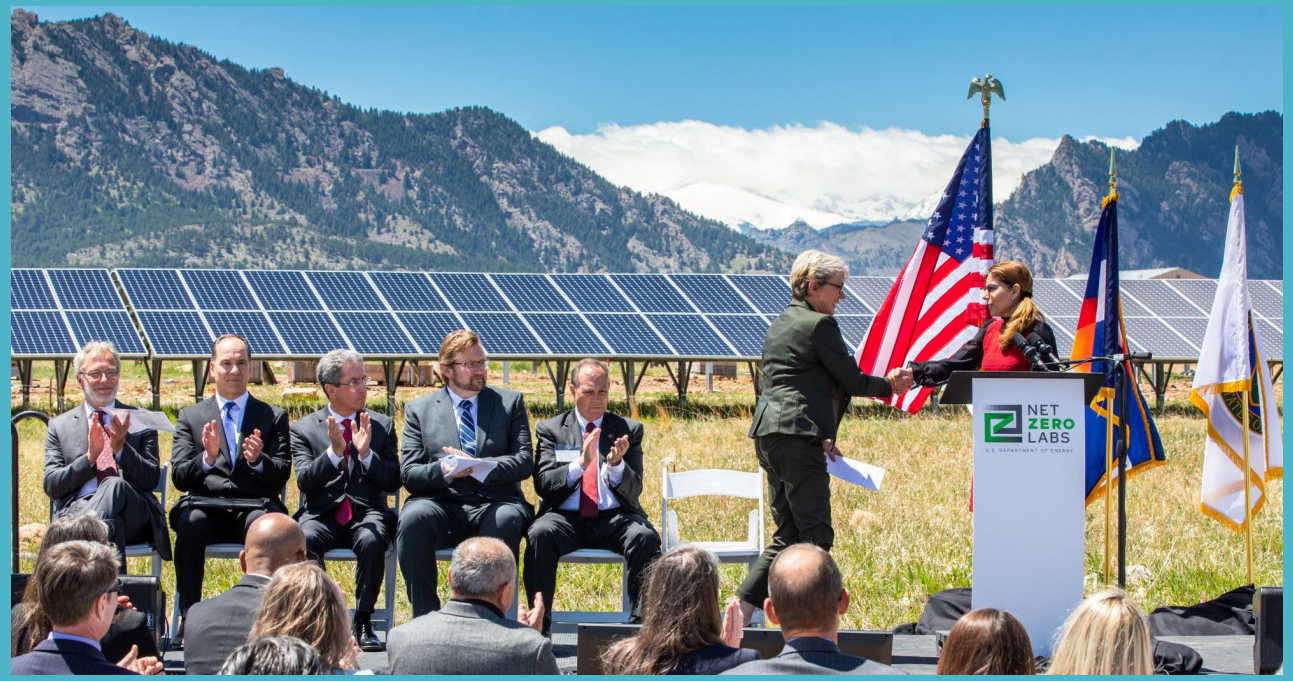
Net Labs Pilot Initiative



Secretary Granholm announces the launch of DOE Net Zero Labs on May 25, 2022

Four Lab Collaboration

- ✓ 2020: Four labs working on net zero efforts saw opportunity to collaborate as pilots across DOE
- ✓ Jun 2021: Asst Secretary of Energy issues charge letter to the pilot labs to develop roadmaps, engage with other labs, and engage with stakeholders
- ✓ Aug 2021: Pilot labs complete roadmaps to achieve net zero between 2026 and 2034
- ✓ Oct 2021: Hosted decarbonization Workshop for 17 national labs
- ✓ Initiated stakeholder engagements
- ✓ May 2022: DOE publicly launches pilot NZL initiative

NZL Guiding Principles and Motivation

"Walking the talk" on decarbonization

Labs are among the largest and most complex energy users in the Govt
We are up for the challenge to tackle the hard problems

"Anything is possible"

If energy-intensive Labs can be net-zero, then anything can be net-zero

Showcase S&T and climate leadership

Processes, tech, and systems developed at DOE Labs for NZL will promote American innovation to the world

Across the board

NZL addresses challenges in all the major sectors of emissions: facilities, industry, transportation, and even agriculture

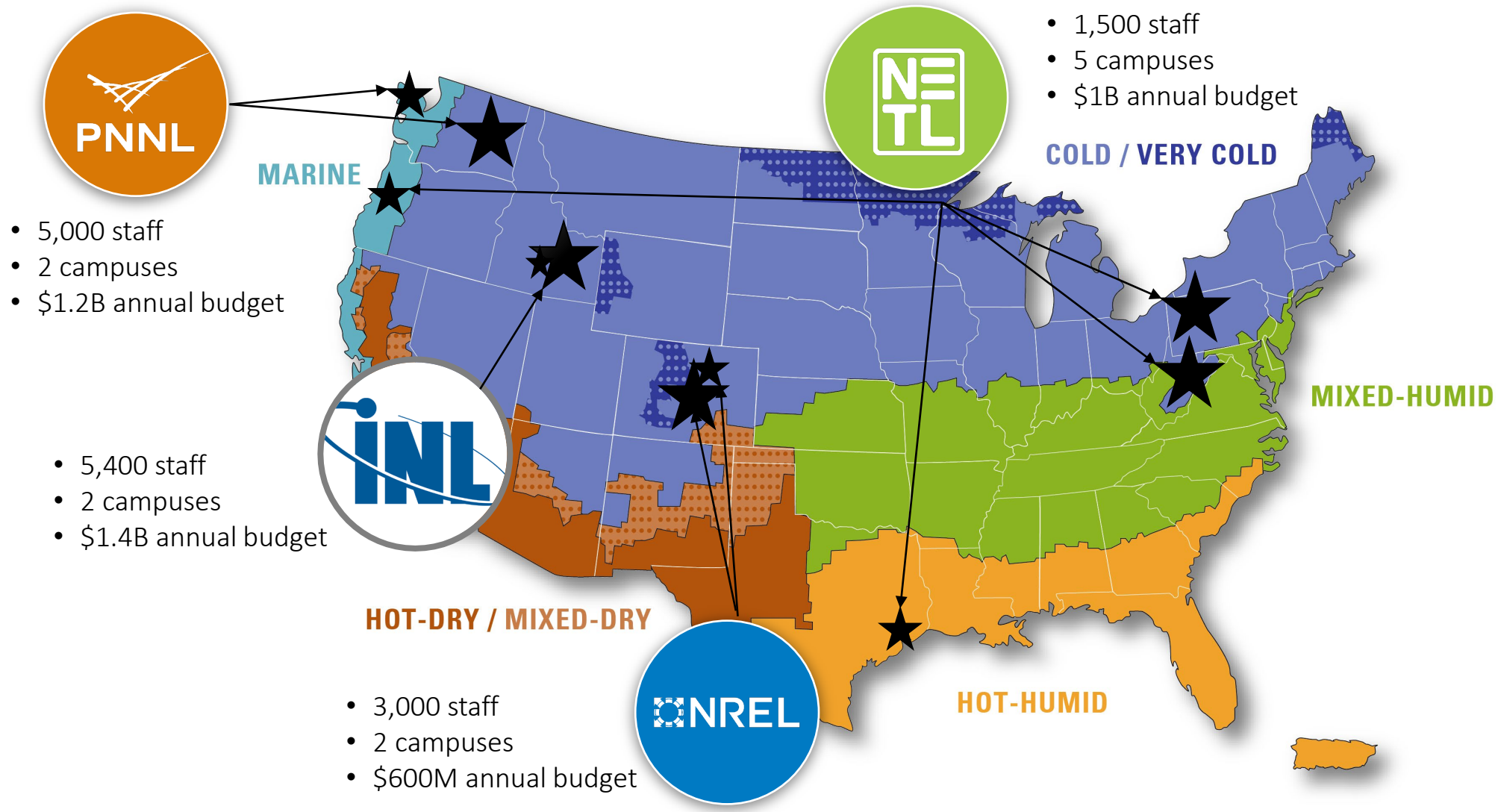
Across the Nation

NZL labs cover four of the seven major U.S. climate zones and represent a wide range of energy and emissions mixes

Workforce-driven

NZL has staying power because it was born internally from motivated lab personnel, not from the top down

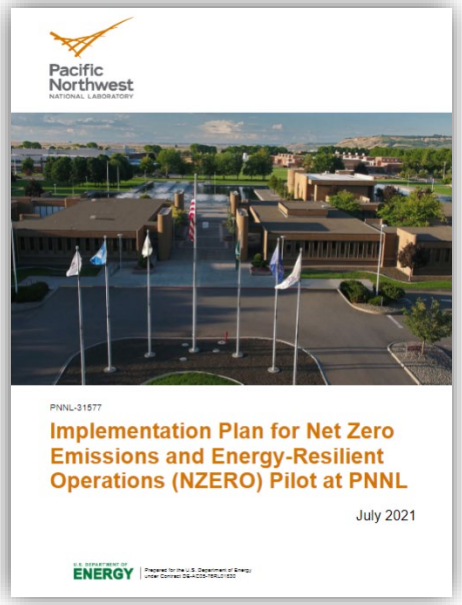
Pilot Launch: 4 National Labs, 10 campuses, diverse regions



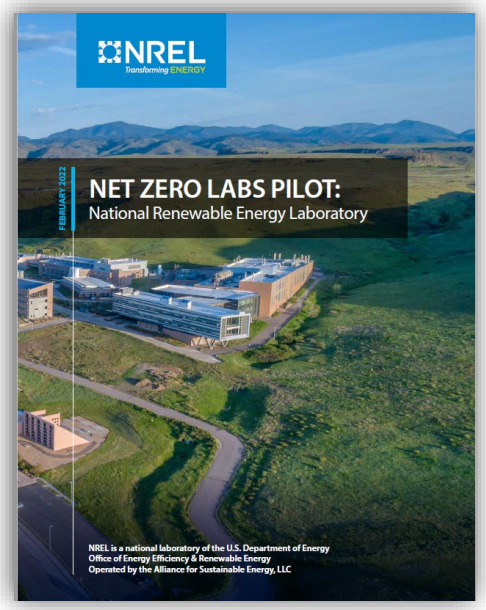
4 pilot labs - Vision to expand to all 17

NZL Implementation Plans

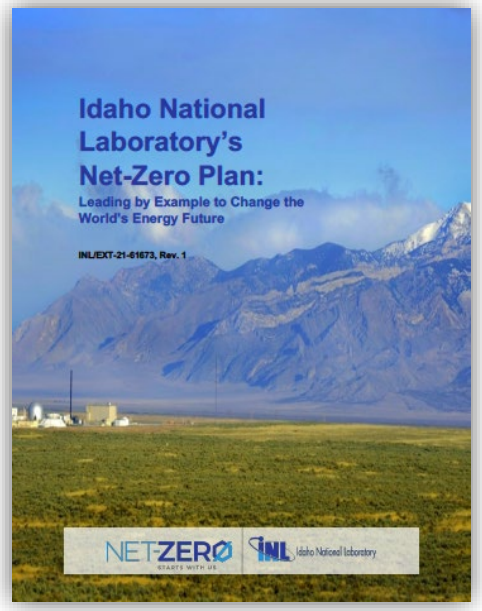
https://netl.doe.gov/node/11790



https://www.pnnl.gov/net-zero



https://www.nrel.gov/about/net-zero-labs



https://inl.gov/net-zero/

NZL Plan Highlights

INL

Planned Energy Source:
Nuclear & Hydrogen

Primary Mitigation Tool:
Nuclear-enabled microgrid

Signature Research:
Advanced nuclear on integrated microgrid

PNNL

Planned Energy Source:
Electricity

Primary Mitigation Tool:
Electrification, efficiency and district energy

Signature Research:
Data-driven, optimized control of diverse energy assets

NREL

Planned Energy Source:
Electricity, Hydrogen

Primary Mitigation:
Efficiency, electrification, and ground source heat pumps

Signature Research:
Advanced distributed energy districts

NETL

Planned Energy Source:
Biomass, Electricity, and Natural Gas

Primary Mitigation Tool:
Negative Emissions Tech. Carbon Storage
Net Zero Power Purchase
Combined Heat & Power

Signature Research:
Integrated Energy System
(Biomass, CCS, H_2)
Direct Air Capture

Next Steps for NZL Pilot Collaboration

NZL Planning Tools and Methods	Funding for NZL Implementation Plans	Federal Stakeholder Collaboration
• Net zero campus scenario planning • CFE emissions accounting and role of EACs • Getting started with low-hanging fruit	• Strategies for attracting investment within existing budgetary frameworks • Demonstration projects that leverage strengths and have broad applicability to DOE and other federal sites	• Explore collaboration with other agencies to share lessons learned to reach net zero

NREL Net Zero Goals

Proposed Decarbonization Targets for NREL's **Operational** Footprint

End of FY23
Flatirons campus to operate at net zero emissions (Scope 1 and 2 only)

End of FY26
South Table Mountain campus to operate at net zero emissions (Scope 1 and 2 only)

End of FY30
Demonstrate NREL campus operations with 24/7 carbon-free energy (Scope 1, 2 and 3)

STM Campus
- Xcel Energy supplies 31% clean energy for purchased electricity
- 23% clean energy with solar and biomass

Flatirons Campus
- 33% clean energy with wind and solar
- Net-zero electricity annually

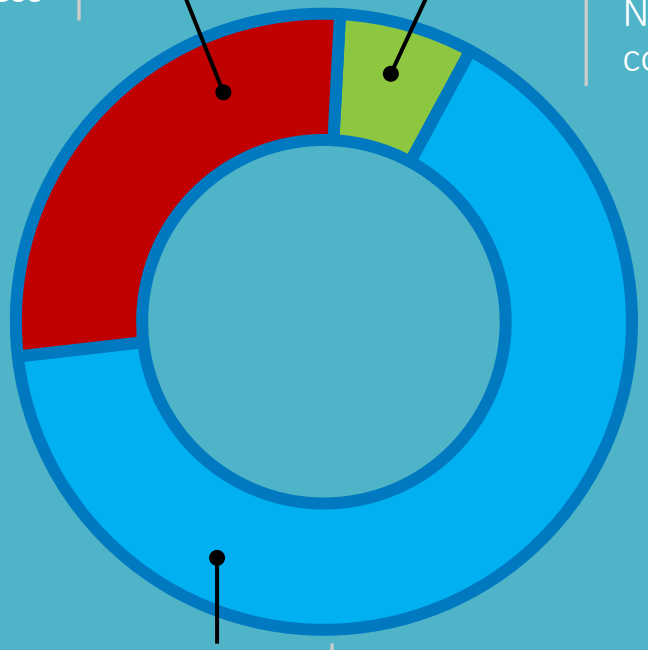
Tools for the biggest reduction

SCOPE 3:
Indirect emissions from doing business

9,948 $MTCO_2e$

2,539 $MTCO_2e$

SCOPE 1:
Direct emissions from sources NREL owns or controls



23,518 $MTCO_2e$

SCOPE 2:
Indirect emissions from purchased electricity and heating

Challenges and Solutions

SCOPE 1:
Challenge: Natural gas supplies central plant
Solution: Conversion to non-carbon fuel sources

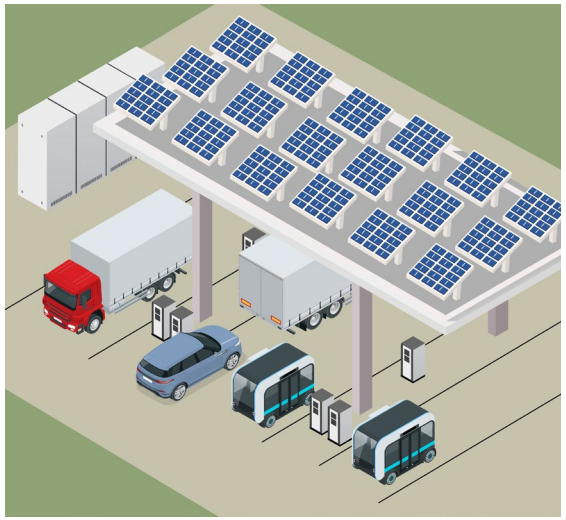
SCOPE 2:
Challenge: Xcel Energy 80% clean power by 2030
Solution: On-site and Off-site Renewable Systems

SCOPE 3:
Challenge: Staff Commuting and Business Travel
Solution: Increased staff ownership of electric vehicles, hybrid and remote work, and continuous use of virtual meetings

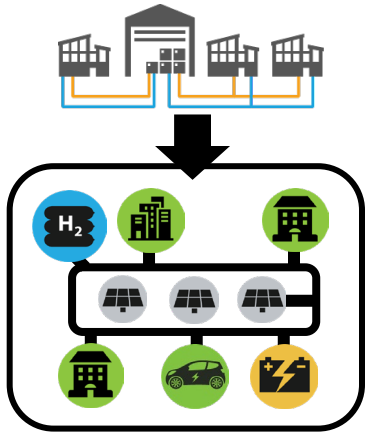
**Offset purchases only for Scope 3 or research emissions that cannot be mitigated*

Major Initiatives / R&D Focus Areas

Fleet Electrification

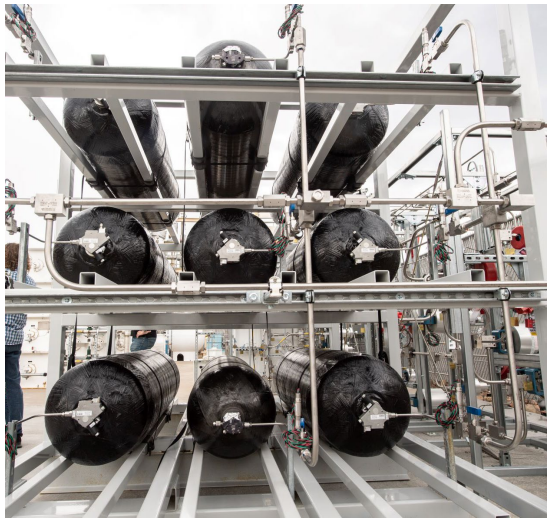


Distributed Energy District

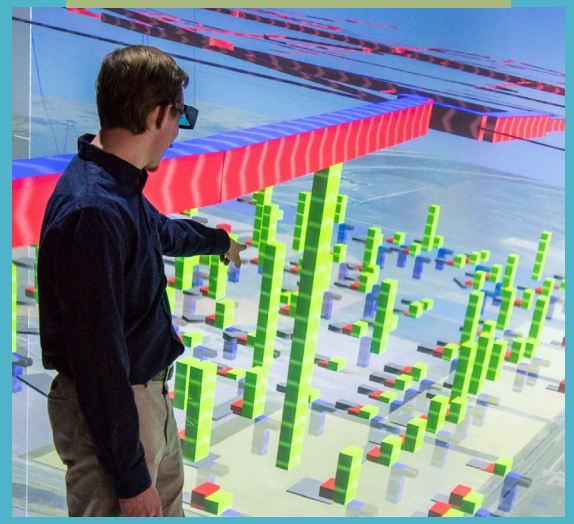


Renewable Energy

Back-up Power



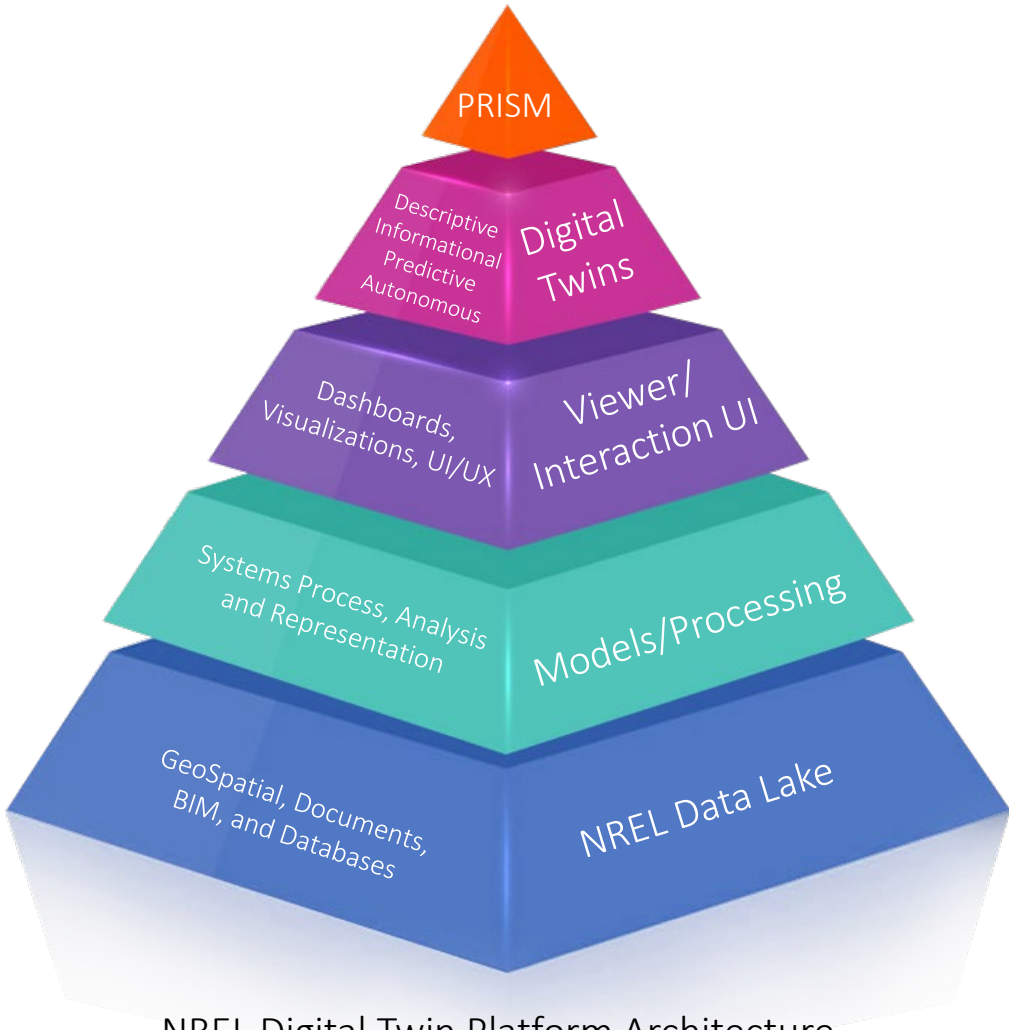
AI for Operations



Next Steps

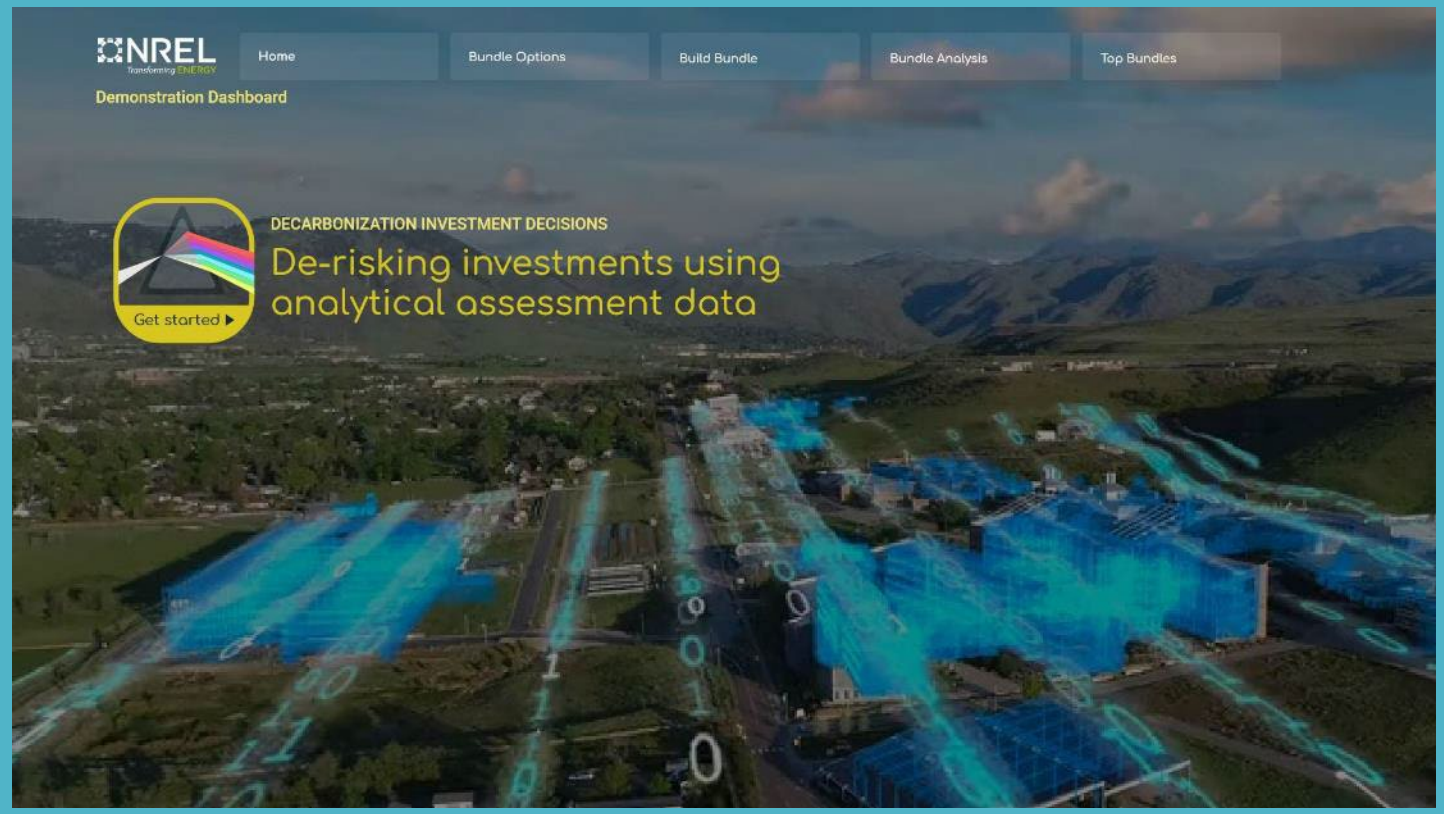
- ✓ Contracting Fleet Electrical Vehicles when available from GSA
- ✓ Converting Natural Gas Supply for HVAC equipment to non-carbon resources
- ✓ Procuring Solar and Energy Storage through Power Purchase Agreements (PPAs)
- ✓ Replacing diesel generators with hydrogen fuel cells
- ✓ Developing Digital Twin for Planning and Investment

NET ZERO LABS PILOT:
National Renewable Energy Laboratory



NREL Digital Twin Platform Architecture

AI for Operations



- ✓ Integrates disparate dynamic and static data for **interoperability** to achieve and sustain net zero emissions and resilience readiness that supports mission critical objectives.

https://nrelghg.azurewebsites.net

NET ZERO LABS PILOT:
National Renewable Energy Laboratory

INL Net Zero Goals

Proposed Decarbonization Targets

End of FY23
Continued fleet transition

End of FY24
MARVEL demonstration underway
Landfill emissions assessment complete

End of FY26
50% CO2e reduction

End of FY31
Demonstrate INL campus operations with 24/7 carbon-free energy (Scope 1, 2 and 3)

Desert Site
- Idaho Power supplies electricity
- Clean Energy Your Way proposal under review

Research & Education Campus
- Idaho Falls Power
- Clean Energy Program

Tools for the biggest reduction

INL's Scope 1, 2, & 3 Emissions (FY19)

SCOPE 1:
Challenges: Converting HVAC, Landfill emissions unknown, Limited EV availability
Solutions: Building electrification, landfill monitoring, and use of R99

SCOPE 2:
Challenge: Idaho Power + Idaho Falls Power
Solution: Pursue clean power options & potential to add nuclear

SCOPE 3:
Challenge: Staff Commuting and Business Travel
Solution: Expand public transit options for employees, continue hybrid and teleworking options, establish Bike Commuter Resource Center, Net-Zero iMap tools, install additional EV charging stations for staff EVs

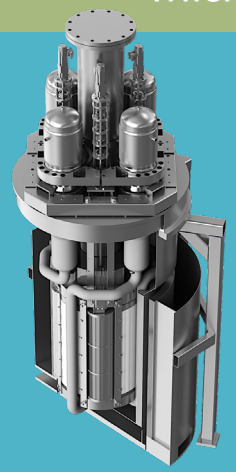
Major Initiatives / R&D Focus Areas

Fleet Electrification

Nuclear-Enabled Microgrids | Hydrogen Production

Value-Added Products

Nuclear-Enabled Microgrids

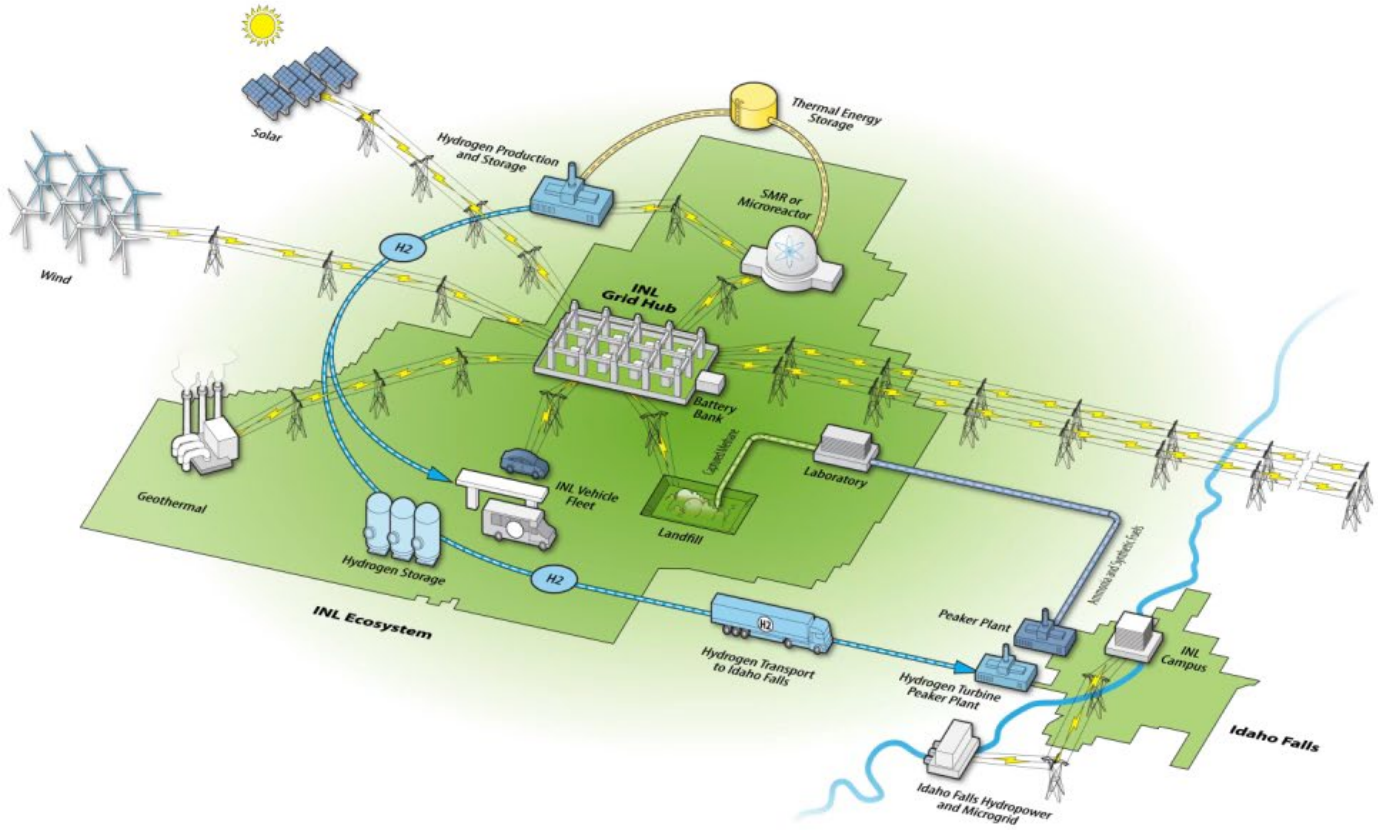


Next Steps

- ✓ Contracting Fleet Electrical Vehicles when available from GSA; R99; hydrogen fuel cell motorcoach testing
- ✓ Developing scaling microgrids for microreactor and small modular reactor demonstrations
- ✓ HVAC electrification
- ✓ PPAs with energy suppliers

NET ZERO LABS PILOT:
Idaho National Laboratory

INL secure, resilient net-zero energy future.



Discussion

What resources do decision makers and operators of federal campuses need that the Net Zero Labs Initiative might help address?

What do you see as collaboration opportunities for the Net Zero Labs Initiative and ISWG?