2024 PROJECT PEER REVIEW

U.S. DEPARTMENT OF ENERGY
BUILDING TECHNOLOGIES OFFICE

BTO Peer Review: Buildings Upgrade Prize (Buildings UP)

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WBS #, 1.4.1.51 and 1.4.1.50

Project Summary

OBJECTIVE: A multi-year prize competition to catalyze the equitable decarbonization of residential and commercial buildings nationwide through widespread heat pump (HP) and heat pump water heater (HPWH) adoption.
FY24 OUTCOME: Teams are preparing for deployment of ~400 heat pumps and HPWHs with equity, affordability and quality requirements during their initiative pilots.
IMPACT: Demonstration of equitable decarbonization in 40+ communities nationwide, energy and carbon savings, best practices resources to replicate efforts.

STATS:
Performance Period: FY22-FY28

FY24 Budget: $23M, Cost Share: $0 required

Milestone 1: Concept Phase Awards to 45 teams

Milestone 2: Planning Phase Awards to 42 teams

Milestone 3: Pilot Initiative Phase Awards (FY 25-27)

Milestone 4: Full Scale Initiative Phase Awards (FY27-28)

TEAM & PARTNERS:
- Prize Manager/Project Lead: BTO & NREL

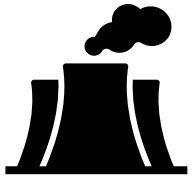
Technical Assistance and Support for Teams:
- Regional Energy Efficiency Organizations (MEEA, SEEA, SWEEP, SPEER, NEEA, NEEP)
- ACEEE
- Emerald Cities Coalition
- Elevate
- Guidehouse
- HR&A
- ICF
- NORESCO
- VEIC
- Building America Experts

AMERICAN MADE BUILDINGS PRIZE

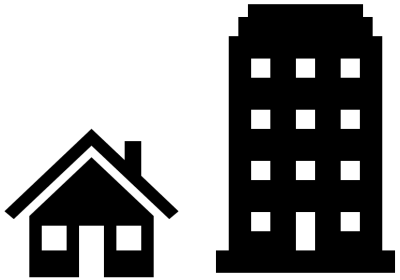
U.S. DEPARTMENT OF ENERGY

Problem: The U.S. building stock includes 123 million homes and 5.9 million commercial buildings that:

Consume ~40% of all US energy and 75% of all electricity, at a cost of $400B+/yr.



Account for 35% of the country's CO2 emissions.



With HVAC and water heating accounting for over 60% of energy use in the U.S. building stock.

Solution: HP & HPWHs can significantly reduce energy use and carbon emissions of buildings.

HPs can reduce electricity use for heating by ~ 65% compared to electric resistance heating, HPWHs can be two to three times more energy efficient than conventional electric resistance water heaters. **Source:** U.S. Department of Energy, Energy Saver website, accessed Sept 22, 2024. https://www.energy.gov/energysaver/heat-pump-water-heaters

Problem: To meet decarbonization goals, adoption needs to accelerate by 3x for HPs and 10x for HPWHs by 2032.

Challenges* Limiting HP & HPWH deployment

- Low contractor familiarity and insufficient numbers of skilled workers to design, finance, install, and maintain HP/HPWHs
- Lack of coordination among local stakeholders such as, utilities, affordable housing, government, and banking
- HP performance is not optimized when a building envelope is “leaky” and contractor unfamiliarity of the building as a system can have a detrimental impact if weatherization upgrades (where needed) are not completed.
- Inconsistent quality of installation work and consumer mistrust.
- High first costs can limit adoption in lower income communities.

***Challenges were identified through a lit review & stakeholder engagement in FY22.**

Sources: *Pace of Progress*, Rewiring America. 2023. https://a-us.storyblok.com/f/1021068/x/1c5bfb0365/pace_of_progress_2024.pdf Amann, J., R. Srivastava, and N. Henner. 2021. Pathways for Deep Energy Use Reductions and Decarbonization in Homes. Washington, DC: ACEEE. https://www.aceee.org/sites/default/files/pdfs/b2103.pdf, https://escholarship.org/content/qt78k303s5/qt78k303s5.pdf, Weatherization Cuts Bills and Creates Jobs but Serves Only a Tiny Share of Low-income Homes | ACEEE, Joe, Jaewan, Malhotra, Mini, Lapsa, Melissa Voss, and Baxter, Van. 2021. "US Heat Pump Market Overview – 2020". United States. https://www.osti.gov/servlets/purl/1885402

The Buildings Upgrade Prize (Buildings UP)

Launched in January 2023, Buildings UP is designed to rapidly scale energy efficiency and efficient electrification building upgrades in communities across the country.
The prize is envisioned to consist of four phases over approximately five years.

Teams are working in rural, urban, suburban, tribal communities addressing single-family, multifamily, small and large commercial buildings, manufactured and mobile homes.

Pathways	Open Innovation	Equity-Centered Innovation
Phase 1 Teams	6	39
Base Prize	$200k/ phase	$400k/ phase
Bonus Prize	$400k ($80k / team up to 5 teams)	
Technical Assistance (TA)	140 hours 1:1 TA	100 hours 1:1 TA

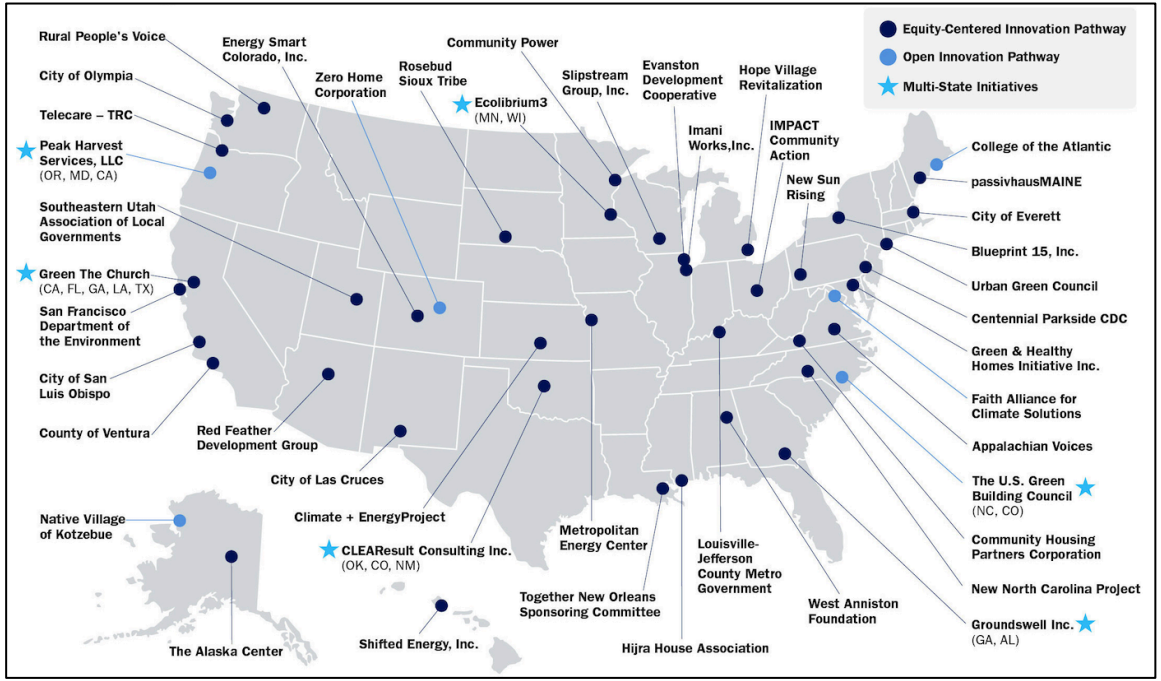
4 Phases over 5 Years:
Phase 1: Concept (awarded FY24)
Phase 2: Planning (reviewing submissions)
Phase 3: Pilot Initiative (opens soon!)
Phase 4: Full-Scale Initiative (anticipated)

Approach: Award diverse projects to create a comprehensive portfolio

Team Leads - Organization Type
- 5 Tribal/Native
- 10 Local Governments
- 23 Community-Based Organizations
- 10 Minority/Women-Owned

Residential Buildings: 39 Teams
- 33 Teams -**Single Family**
- 7 Teams -**Manufactured Homes**
- 26 Teams -**Multi-family**

Commercial Buildings: 19 Teams
- 4 Teams -**Schools**
- 1 Team -**Libraries**
- 8 Teams -**Community Centers**
- 5 Teams -**Churches**



Community Types: Rural- 18, Suburbs- 6, Towns- 15, Cities- 24, Neighborhoods- 8

Climate Zones: Teams are working in zones 1-8

Approach: Utilize a Novel Funding Mechanism

America COMPETES Act of 2010 gives DOE authority to award prizes.

What makes a Prize different from a Grant?

Winners are rewarded for work completed, not for future work

Benefits

- DOE pays only for successful work
- DOE gets funds out quickly
- Phased prize structure allows DOE to be agile, can learn and address needs throughout prize
- No contract with government lower application burden attracts new entrants

Potential Drawbacks

- Awardees can drop out at each phase
- DOE cannot directly negotiate awardee scope with each awardee
- No required status updates from awardees may result in less visibility into team progress

Approach: Thoughtful Planning & Set Up

Risk	Prize Design Risk Mitigation Principles	Buildings UP Mitigation Strategies
Drop out/ Lack of Engagement	"Right size" phase durations and award amounts. Vet award level and phase durations with stakeholders.	**Buildings UP**: Stakeholder Inputs/ Webinars to gather requirements, Quarterly deadlines over 12-mo. to allow teams to move as fast (or slow) as they need to.
Drop out/ Lack of engagement	Build value into continued engagement between submissions through Technical Assistance, trainings and peer learning for teams.	**Buildings UP**: • "Coopetition Model", no forced down select builds collaboration • Training series (Average of 30 teams represented on each webinar in FY24) • 1:1 Technical Assistance support for teams • Peer sharing community collaboration site • 8 Affinity groups, developed with team input
No direct control on scope	Thoughtfully design the phased prize structure and review criteria to define the scope. DOE can modify rules mid-way if needed.	**Buildings UP**: Feedback from teams led us to modify rules to allow additional ways of meeting a requirement. Rules for each phase are developed as Prize Team learns and adapts to team needs.
No obligation to report (less visibility for DOE)	Build data collection/metrics into submission requirements as a strategy for gaining status updates and/or market/industry knowledge in absence of reporting requirements.	**Buildings UP**: 20+ HP adoption challenges identified around workforce availability and training such as lack of virtual training options, availability of energy auditors and trained HP contractors. Funding for weatherization, health and safety upgrades, and commercial building upgrades is also challenging.

Approach: Create a Support Network for Teams

Support Mechanism	Buildings UP
• **TA hours: Teams awarded 100-140 1:1 TA hours, depending on pathway** • **Regional Navigator assigned to each team depending on location.**	• 1304 1:1 TA hours used to date • All 45 teams have used 1:1 TA hours • REEOs support 5 geographically-based cohorts
• **Affinity Groups: Developed with Team inputs, first 6 months managed by TA providers** • **Team participation and championing of groups will continue pending on each groups' preferences.**	• BIPOC – 38 teams joined • Community Engagement – 38 • Community Serving Commercial Buildings - 21 • Energy Navigator Models - 20 • Funding and Financing – 26 • Health and Safety - 24 • Mitigating Electricity Bill Increases - 21 • Rural Communities - 25
• **Community Site**	• All teams are connected to other teams, TA providers and Regional Navigators on the Community Site

Approach: Active Support Network

Regional Navigators:
Help teams navigate regional resources and gain local market knowledge.

Technical Assistance :
Provide 1:1 and group assistance in areas critical for HP/HPWH deployment.

Affinity Groups:
Provides topic-based peer learning with TA support for 6-months, teams can continue on their own afterwards.

Collaboration Site:
Enable peer networking and learning, resource sharing, collaboration among team members and between teams.

Regional Navigators

- Served by all 6 Regional Energy Efficiency Organizations: MEEA, SEEA, SWEEP, SPEER, NEEA, NEEP

Technical Assistance Providers (TAP)

- R2E2- Equity-focused consortium with ACEEE, Emerald Cities Coalition, Elevate, HR&A
- ICF -Building Stock Analysis (BSA)
- Guidehouse- Program Design and BSA
- NORESCO-Workforce Training and BSA
- VEIC –Technology and Health and Safety Consultant
- Building America Subject Matter Experts – Technology Consultants
- Elevate- Workforce Development Programs

Alignment and Impact

Decarbonization Blueprint	Buildings UP
• **Catalyze the transition**. Examples include reducing the cost of HP, improving public awareness of low-carbon solutions and their benefits, providing technical assistance and workforce training before 2030.	• 45 teams developing initiatives to transition communities to HPs with 1:1 support from experts. • TA available on wide range of topics including cost analysis, workforce assessment and training.
• **Focus on adapting and scaling**, with efforts to update market integration support, incentives, and training resources for high-impact technologies by 2040.	• Teams addressing wide range of building types nationwide, developing lessons learned for others and to inform full scaling of initiatives. Teams identify what can be replicated in other building types, communities and climate zones in Phase 2 submissions.
• **Complete the transition** through activities such as enabling technology adoption and prioritizing retrofits in lagging segments by 2050.	• Building capacity among teams and efficiency practitioners to scale adoption in lagging segments (i.e. rural, tribal, underserved areas). • Teams utilizing newly commercialized HPs (e.g. 120v HP in mobile homes, window units in NYC)

Impacts: Project Goals

1. Accelerate building upgrades - HP, HPWH, weatherization where needed
2. Advance holistic and lasting initiative development
3. Demonstrate scalability and replicability across building, climate zone and community type(s)
4. Benefit underserved communities by ensuring that benefits accrue to equity-eligible buildings

Equity-eligible buildings include buildings in disadvantaged communities; low- and moderate-income (LMI) households; and underserved commercial, nonprofit, and public buildings.

Results if Goals are Met

- Phase 3 will result in 100's HP/HPWH upgrades.*
- Phase 4 will result in potentially 1,000's of HP/HPWH upgrades.*
- Many replicable examples of holistic and lasting initiatives created with support from technical assistance in providers.
- Replicable examples include a wide range of building types in every region of U.S. to enable widespread scaling of HP/HPWH adoption.
- Equity considerations in planning and implementation result in benefits accruing to equity-eligible buildings and underserved areas.

**Actual results depend on pass rates in each Phase.*

Impacts: Success Metrics

- Number of teams passing each phase
- Number of HP & HPWH upgrades completed
- Number of replicable examples documented and shared publicly
- Equitable approach in underserved communities is well understood, documented and shared publicly to enable equitable decarbonization
- Number of health and safety and weatherization upgrades completed in equity-eligible buildings
- Number of trained and/or certified HP/HPWH contractors, energy assessors

How teams plan and implement initiatives is just as important as the number of deployments achieved.

Critical Success Factor Categories*

1. Team and Budget
2. Community and Stakeholder Engagement / Benefits
3. Technology Suitability
4. Initiative Goals and Metrics
5. Financing and Funding Building Upgrades
6. Workforce and Supply Chain Capacity
7. Subscriber Strategy and Approvals
8. Quality Assurance and Consumer Protection
9. Risk Assessment and Mitigation Strategies
10. Scaling and Replicability

**Teams must meet all minimum requirements in each of the10 categories to win an award.*

Progress: Phase 1 Teams

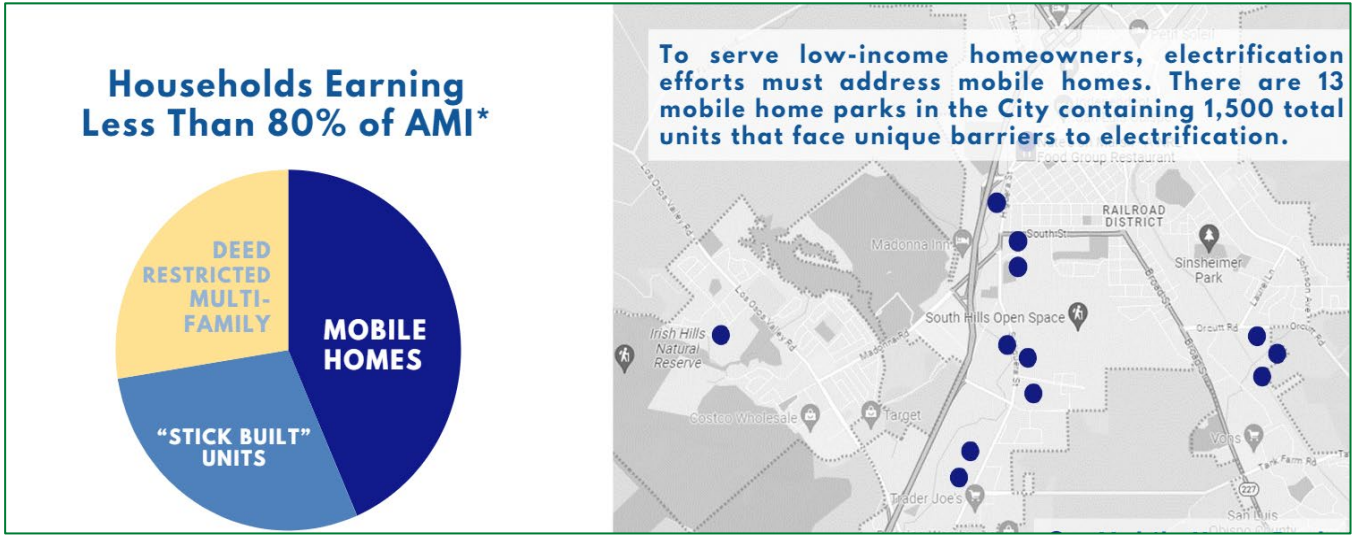
City of San Luis Obispo is pursuing a mobile home upgrade initiative with 120v HPs.

Lead Type:
Local Government

Building Type:
Mobile Homes

Technology Type:
120v HPs

Community Type:
City (San Luis Obispo, CA)



Collaborating Partners

Supporting Partners

Progress: Phase 1 Teams

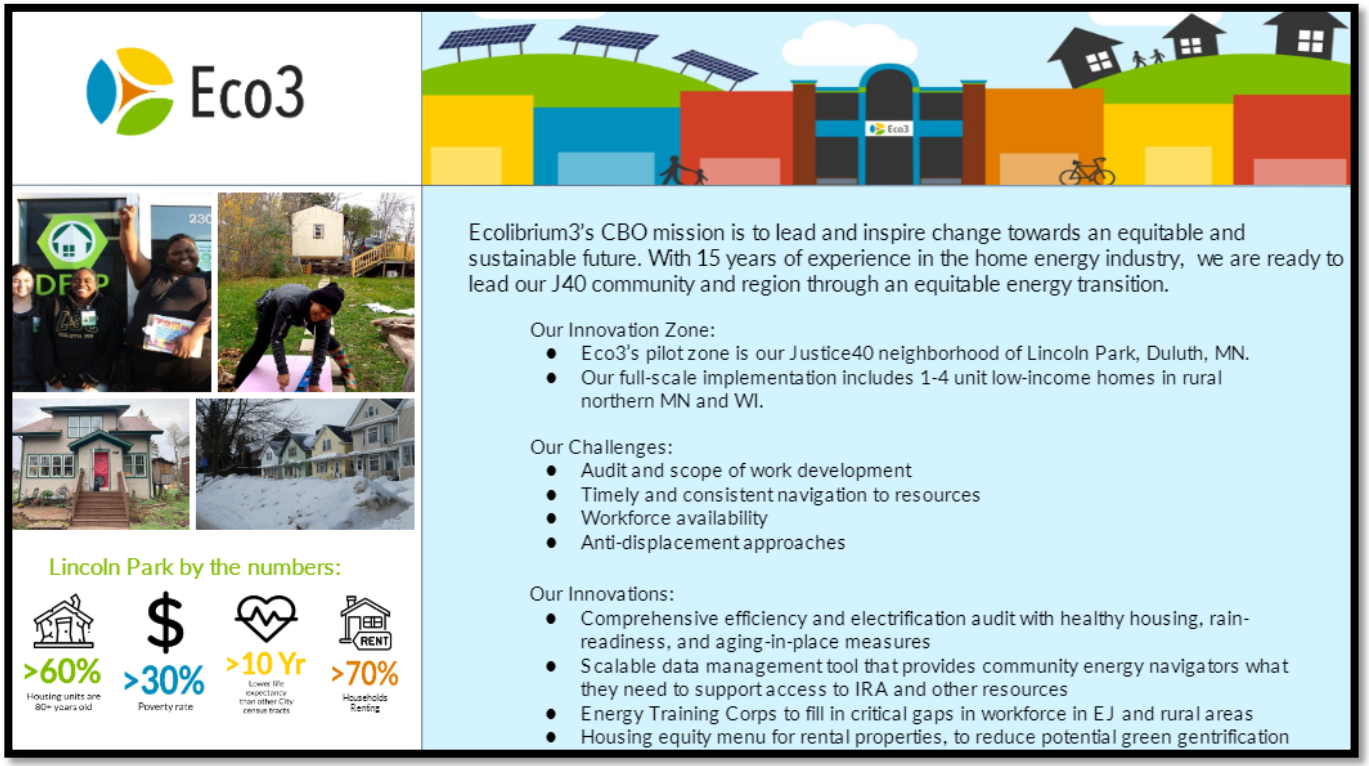
Eco3 creating an Energy Training Corps: 25 people weatherizing homes and learning job skills

Lead Type:
Community-Based Organization (CBO)

Building Type:
Low-Income Single-Family Homes

Technology Type:
Cold Climate HPs

Community Type:
Small City (Duluth, MN)



Progress: Phase 1 Teams

Addressing low-rise multifamily with centralized HPWH that can provide grid services.

Lead Type:
Nonprofit

Building Type:
Low-rise Multifamily

Technology Type:
Central HPWH

Community Type:
Large City (NYC)

Urban Green Council

Equitable, Carbon-Free Hot Water in NYC

Old, low-rise multifamily buildings in NYC

Equity-Centered Innovation

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Phase 1 Concept Description:

Scale heat pump water heater retrofits in old, low-rise multifamily buildings located in New York City's disadvantaged communities.

Team Organizations:

Urban Green Council – Local building decarbonization nonprofit

RiseBoro Community Partnership – Local nonprofit affordable housing owner, operator and developer

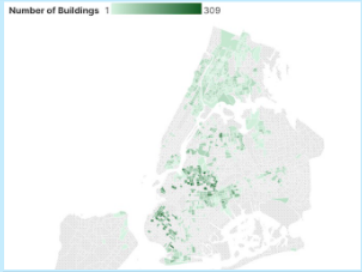
Con Edison – Electric utility servicing most of NYC

Key Innovations:

Improve contractor familiarity

Emphasize thermal storage for grid stability and lower energy bills

Develop commissioning and maintenance standards for HPWHs



Submission at-a-Glance

Technologies
Heat pump water heater with significant storage capacity

Community Benefits
Reliable performance of vital building system

Minimize utility costs

Building Types
Multifamily Buildings
- More than 5 units
- Less than 8 floors
- Built before 1940
- Located in disadvantaged community

Community Type
Dense urban residential neighborhoods

Full-Scale Initiative Goal
Up to 100,000 buildings citywide

urban green

RiseBoro COMMUNITY PARTNERSHIP

conEdison

Buildings UP | U.S. Department of Energy

Progress: Phase 1 Teams

Addressing houses of worship & food kitchens in multiple communities.

Lead Type:
Nonprofit

Building Type:
Houses of Worship

Technology Type:
HP & HPWH

Community Type:
Suburban (D.C. area)

Progress: Phase 1 Teams

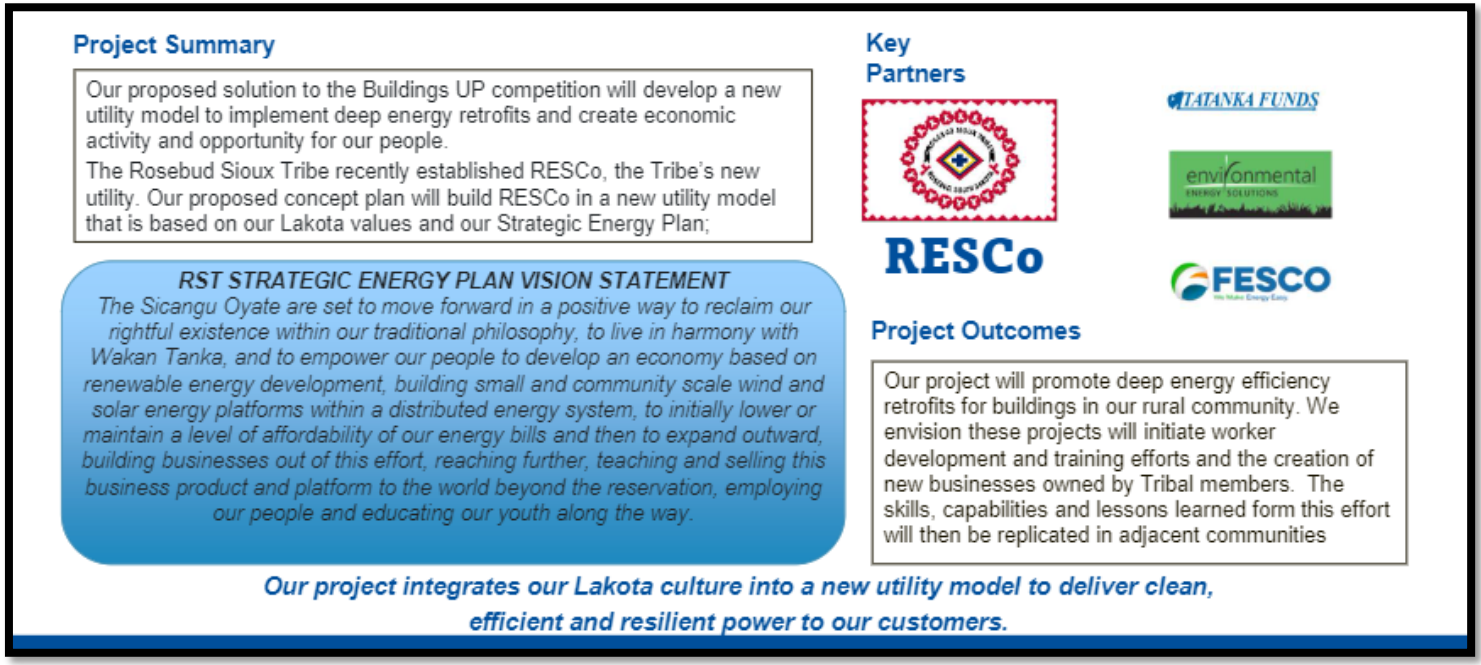
The Rosebud Sioux Tribe is creating a new utility model while preserving Lakota culture.

Lead Type:
Tribal

Building Type:
Central community HP serving many homes / buildings

Technology Type:
Geothermal HP

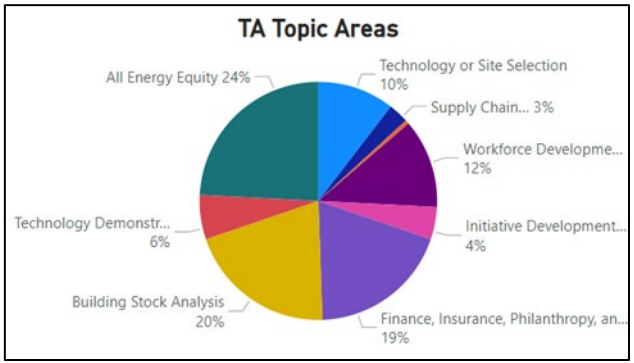
Community Type:
Rural (Todd County, SD)



Progress and Future Work

FY24 Progress:

- 45 Phase 1 teams awarded in FY24
- 14 TA providers in place, building consistency and lasting capacity in the energy efficiency ecosystem



Lessons Learned:

- Tech Demos are not readily available for all scenarios being addressed. Added an option to study 3 similar prior installations.
- Need to simplify Phase 3 submission requirements .
- Documenting challenges and how teams are overcoming.

(e.g., community engagement, workforce availability, funding for upgrades, etc.)

Future Work:

- Issue Phase 3 rules
- Plan for Phase 4
- Collect and publish resources developed for teams through TA, best practices and lessons learned from teams for scaling and replicability nationwide
- Continue to support teams through TA and Community Site resources
- Continue to award teams that meet prize requirements

Thank you

National Renewable Energy Laboratory

Sarah Truitt

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Reference Slides

Project Timeline

Team

Project Execution

	FY2023				FY2024				FY2025			
Planned Budget: (Prize Awards are Forward Funded)	$17,639,000				$23,044,580				$20,082,000			
Spent budget: (FY24 spend through August 2024)	$1,754,470				$21,106,644				tbd			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Past Work												
Q1 Milestone: Execute Technical Assistance Subcontracts	◆											
Q2 Milestone: Launch Buildings Upgrade Prize: Phase 1		◆										
Q3 Milestone: Provide Group Technical Assistance			◆									
Q4 Milestone: Facilitate Reviews of Phase 1 Applications				◆								
Q1 Milestone: Announce Phase 1 Winners					◆							
Q2 Milestone: Get Teams Set up on Community Site						◆						
Q3 Milestone: Facilitate Reviews of Phase 2 Applications							◆					
Q4 Milestone: Finalize Phase 3 Rules for Launch								◆				
Current/Future Work												
Q1 Milestone: Launch Phase 3									◆			
Q2 Milestone: Facilitate Reviews of Phase 2 Applications										◆		
Q3 Milestone: Facilitate Reviews of Phase 2 & 3 Applications											◆	
Q4 Milestone: Facilitate Reviews of Phase 3 Applications												◆

Buildings UP Team
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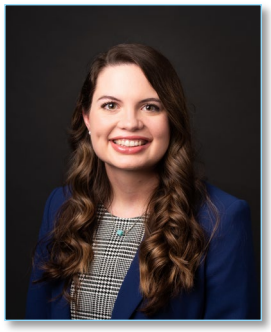

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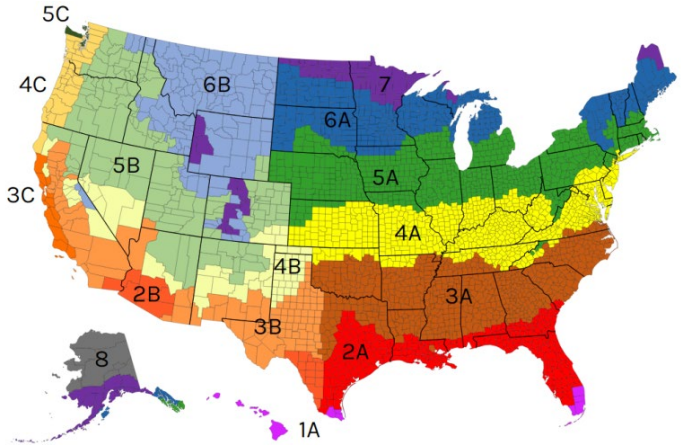
Commercial Co-Lead, DOE

Nate Allen
Commercial Co-Lead, DOE

Megan “Gilly” Plog
Residential Lead, DOE

Teams At-A-Glance



Climate Zone 1A	Climate Zone 2A	Climate Zone 2B	Climate Zone 3A	Climate Zone 3B	Climate Zone 3C	Climate Zone 4A	Climate Zone 4B
2	3	1	7	4	4	12	4

Climate Zone 4C	Climate Zone 5A	Climate Zone 5B	Climate Zone 5C	Climate Zone 6A	Climate Zone 6B	Climate Zone 7	Climate Zone 8
3	9	8	1	4	3	4	2

Sources:

- IECC Climate Zone Map:https://basc.pnnl.gov/images/building-america-climate-zone-map