

Rural Infrastructure Challenge Summit

3/1/2024 Event Recap



About This Project

- The goal of “Cultivating Homegrown Talent: Rural Infrastructure Challenge Summit” is to:
 - Design a convening to develop an entrepreneurial mindset, enhance participatory research, and raise student interest in Public Interest Technology careers.
 - Create a playbook/toolkit for others to host similar events
 - Evaluate effectiveness for evidence-driven program design
- We are funded by [New Venture Fund](#) and [New America](#) through the [Public Interest Technology University Network](#)

Project Team



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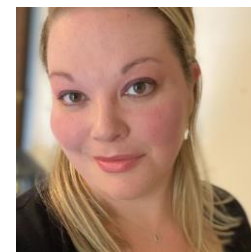
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Community Development



Brandi Richardson
Engagement

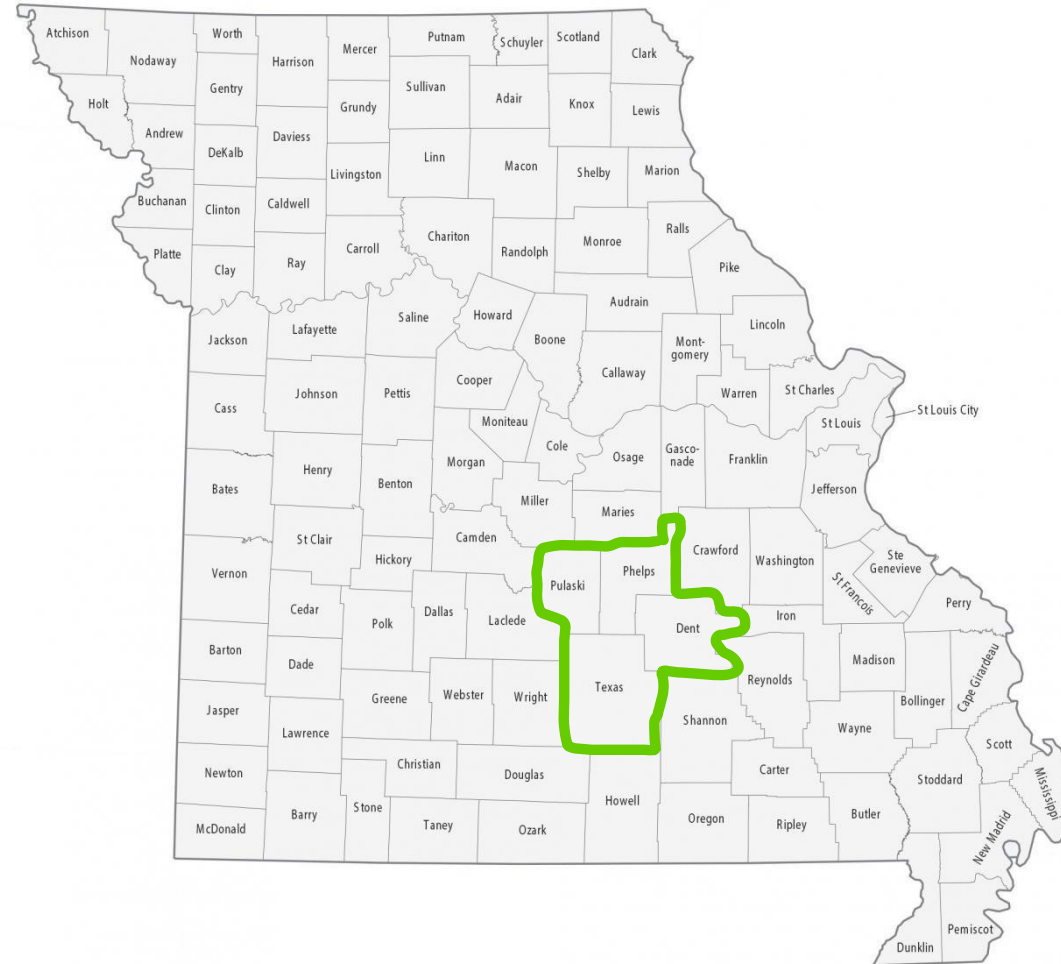


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Preliminary focus on Phelps, Pulaski, Dent & Texas counties.



Event Agenda

- 10:00 am Check-in
 - Receive table assignments and complete pre-survey
- 10:10 am Welcome and Introductions (slides included)
- 10:30 am Team Building Exercise
- 10:45 am Instructions and Examples (slides included)
- 11:00 am Problem Definition Exercises (results included)
 - Step 1: State issues and prioritize list
 - Step 2: Determine root cause
 - Step 3: Draft problem statement
 - Step 4: List principal adopters
 - Step 5: Describe persona and generate user stories
- 12:00 pm Lunch
- 1:00 pm Team Presentations
 - Complete post-survey
- 1:45 pm Closing Remarks

Summary of Team Exercises

- In this pilot event, we hosted 4 tables focused on energy or broadband issues
- Key highlighted issues include:
 - Disconnect between consumer understanding of infrastructure systems and operational requirements
 - Lack of visibility and awareness about infrastructure systems
 - Affordability is a pervasive issue
 - Challenges in hiring and retaining specialized workforce

Energy Table 1

- Step 1: State Issues

- Homeowners' cost
- Energy inefficiency in home appliances
- Lack of variety in energy providers
- Distance between energy generation, which causes large transmission losses
- Increasing number of citizens with power dependent medical needs
- Lack of resilience in utility grid
- Lack of diversity in energy generation sources
- Lack of unique and creative power generation for communities
- Differences in types of utilities
- Lack of knowledge of renewable energy
- Need for permit education
- Need for a central hub for breaking down government rates per county

- Step 2: Five Whys

- Why is it not a bigger priority for more citizens?
- Why don't more utility customers want to pay for modernization of the utility grid?
- Why is renewable energy dependent on federal funding?
- How are more frequent extreme weather events increasing the need for a more resilient utility grid?
- Why is there a lack of urgency?

Energy Table 1

- Step 3: Problem statement

- There is a lack of modernization in generation, storage, and transmission of electricity. Utilities have not kept up with new technologies.

- Step 4: Users/Adopters

- Citizens/utility customers
- Utility companies
- Generation facilities
- Energy distributors

Energy Table 1

- Step 5: Personas

- Jackie, 92

- Married to Harold, who is 90
 - She is diabetic
 - Has a CPAP machine
 - She is at risk if the electricity goes out; can't afford a backup generator
 - They are on a fixed income with no additional resources
 - They have limited access to transportation; have to rely on relatives to get to appointments
 - Willing to sacrifice on comfort

- Success = Having low cost and reliable utilities

- Failure = Electricity goes out and can't run medical equipment she depends on

- Bart, 45

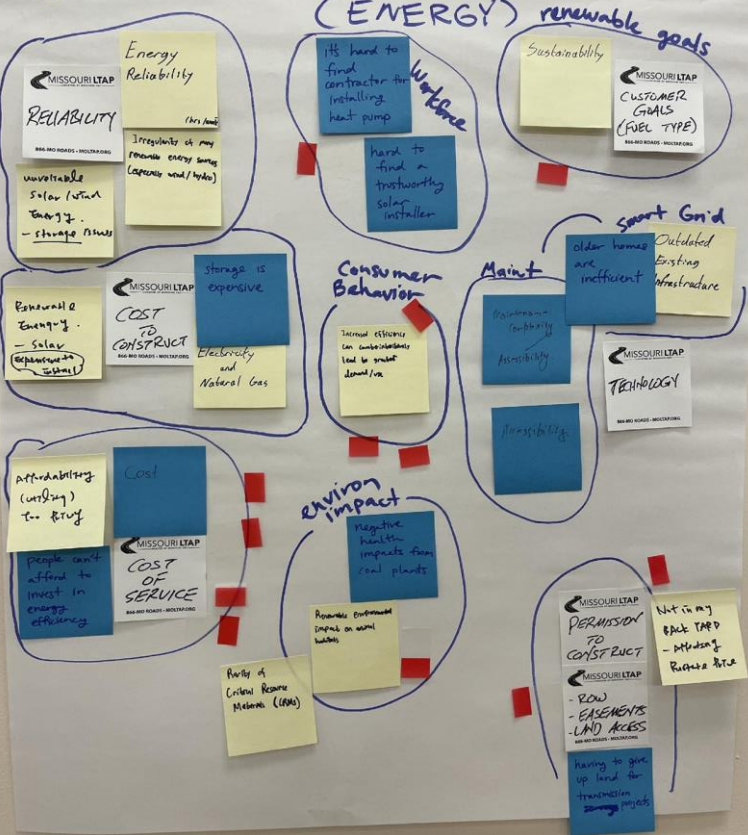
- Second marriage with a younger child
 - The director of a utility co-op
 - He has a PV (solar) array on his house
 - He is considered progressive

- Success = Being able to diversify utility portfolio for co-op members/utility customers

- Failure = Co-op board and members not agreeing with incorporating more renewable energy because their focus is on low cost and dependability

Energy Table 2

STEP 1: STATE ISSUES #2



5 Why's (Step 2)
 Problem: electricity bills are high perceived as #2

Customers use a lot of energy inflation vs wage growth delayed impact

weather building stock

of appliances (?)

Lack of awareness (HVAC temp, phantom power)

more variation

in the background customer demand higher

↳ convenience/standard of living

↳ invisible multiple reasons (rate, usage)

↳ lack of feedback

↳ want vs. need prioritization

↳ time of investment (long term)

↳ no sensors

↳ low population density

Problem Statement (Step 3) #2
 Electricity bills are perceived as high due to high usage.

There is a disconnect between usage and billing due to the time delay.

Users/Adopters (Step 4a) #2

Consumers

- budget aware
- concerned
- off griders
- environmentally aware
- Commercial
- residential
- Industrial

Companies

- Meter companies
- Software developers
- installers

Utilities

- bill designers
- installers

Policy/Regulation

- local
- state
- assistance programs



PERSONA (Step 4b) Success #2

HANK, 68

Residential customer

2^{adult} kids

married

retired, fixed income, disability

Concerned about money

loves his truck

grumpy, first to call

follows all the tips

Failure

- have a low bill
- cost is justified
- perception vs. reality
- have a high bill
- loss of service
- no response from utility

PERSONA (Step 4b) Success #2

Matilda, 25

grad student, mech E

works on motorcycles

Know-it-all

job - research assistant part time at McCalister

buget in spreadsheet

Renter

not much time spent at home

hates calling (wants app)

Failure

- paying expected amount
- predictable bill
- doesn't have to deal with anything
- Surprise bill
- having to call
- app stops working
- Surprise maintenance work
- involving landlord

Energy Table 2

- Step 1: State Issues

- Reliability
- Available workforce
- Setting and meeting renewable energy goals
- Cost of construction
- Cost of service
- Consumer behavior (rebound effect)
- Maintenance costs
- Outdated infrastructure (smart grid)
- Environmental impact
- NIMBYism (Not In My Back Yard)

- Step 2: Five Whys

- Electricity bills are perceived as high
 - Customers use a of energy
 - Weather
 - More variation due to climate change
 - Number of appliances/devices
 - Customer demand is higher
 - Convenience, standard of living
 - Lack of awareness (HVAC, phantom power)
 - Invisible, in the background
 - Multiple reasons why bill can be high (rate, usage)
 - Lack of feedback
 - No sensors/smart grid
 - Low population density
 - Building stock
- Inflation vs. wage growth
- Delayed impact between usage and billing

Energy Table 2

- Step 3: Problem Statement

- Electricity bills are perceived as high due to high usage
- There is a disconnect between usage and billing due to the time delay

- Step 4: Users/Adopters

- Consumers
 - Residential: budget aware, off grid-ers, environmentally aware
 - Commercial
 - Industrial
- Utilities
 - Bill designers
 - Installers
- Companies
 - Meter companies
 - Software developers
 - Installers
- Policy-makers/Regulators
 - Local
 - State
 - Assistance programs

Energy Table 2

- Step 5: Personas

- Hank, 68

- Residential customer
 - 2 adult kids
 - Married
 - Retired, fixed income, disability
 - Concerned about money
 - Loves his truck
 - Grumpy, first to call utility with problem
 - Follows all the tips

- Success = have a low bill where cost is justified

- Failure = have a high bill or loss of service with no response from the utility

- Matilda, 25

- Need for instant information
 - Grad student in Mech E
 - Works on motorcycles
 - Know-it-all
 - Works as a research assistant + part-time at McAlister's Deli
 - Maintains budget spreadsheet
 - Renter
 - Not much time spent at home
 - Hates calling (wants app)

- Success = paying expected amount so the bill is predictable and doesn't have to deal with anything

- Failure = surprise bill, having to call or app stops working, any surprise maintenance work that involves landlord

Broadband Table 3

- Step 1: State Issues

- Cost

- Not affordable
 - Not providing different broadband types
 - Some people cannot afford internet

- Access

- People have to travel for access
 - Lack of broadband in Southern MO
 - Students cannot reliably work on online school work
 - Lack of dependable broadband
 - Some families do not have adequate devices to access broadband
 - Without broadband, online doctor appointments cannot be done

- Workforce Development

- Lack of labor to create infrastructure
 - Lack of adequate workforce to install internet

- Step 2: Five Whys

- Why lack of affordable internet access in rural MO?

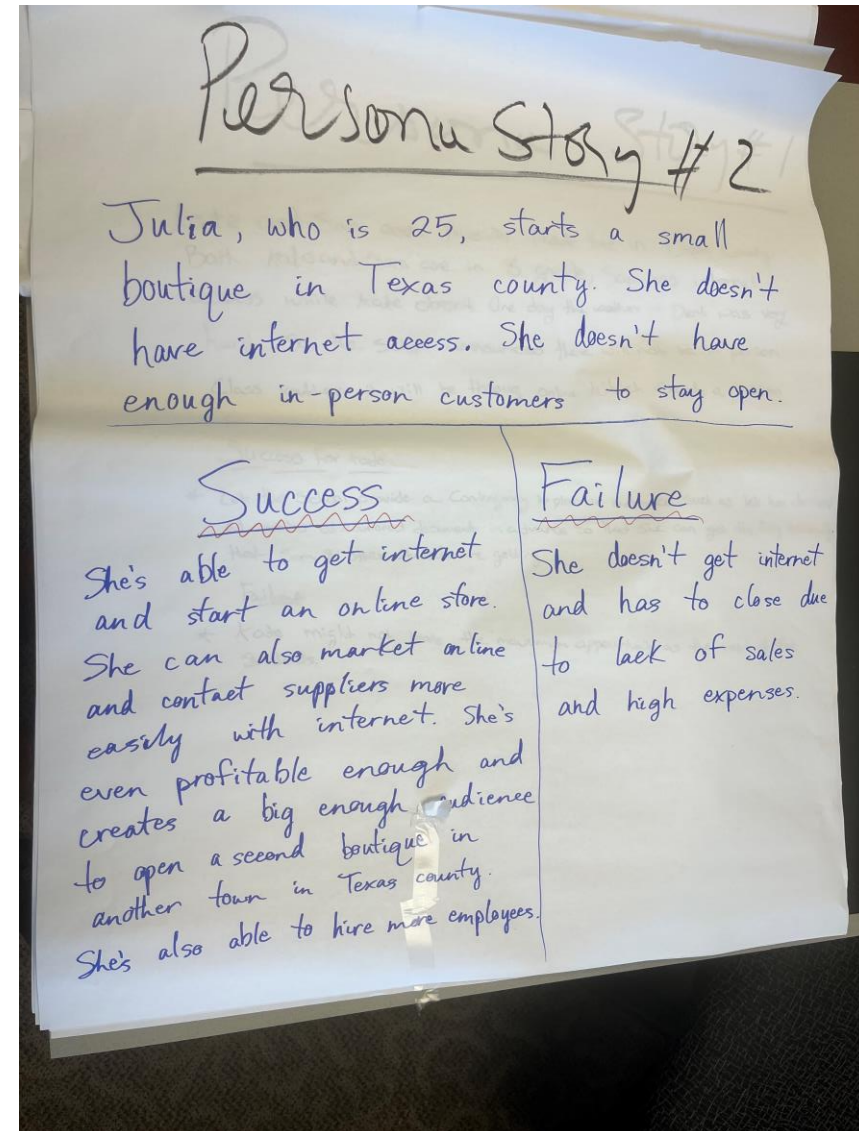
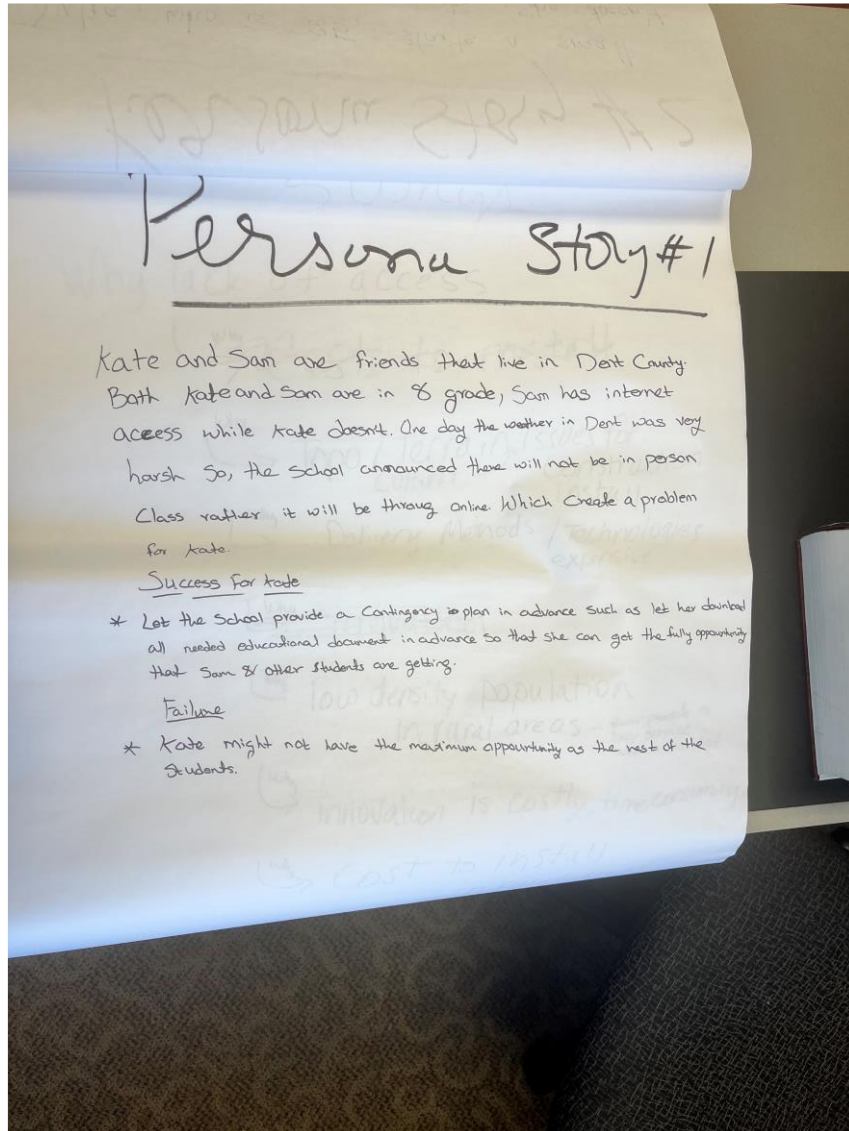
- Topological/terrain/cultural issues for construction and installation
 - Delivery methods/technologies are expensive
 - Low density population in rural areas
 - Innovation is costly and time consuming
 - High broadband installation costs in rural areas



Broadband Table 3

- Step 3: Problem Statement
- There is a lack of internet access in rural areas because it is too expensive to install. This is due to low density population in rural areas, topography/terrain/cultural issues in Southern Missouri's delivery and installation, technology issues, and costly/time-consuming innovation.
- Note: In the four County area, 41% of households /businesses/institutions are underserved or unserved based on 6/30/23 FCC data.
- Step 4: Users/Adopters
 - Consumers
 - Families/Friends
 - Education/Schools
 - Health care/ tele health
 - Elderly students and students with low income
 - Small/local businesses
 - People who work from home online
 - Utilities
 - ISP
 - Broadband Installers
 - IT training
 - Companies
 - Tech industry
 - Software developers
 - Law-makers (e.g., grant funding)
 - Others
 - Landowners where the internet lines travel through

Broadband Table 3



Broadband Table 4

Problem Statement
Many Rural Missourians
Lack access to high speed
internet due to the financial
realities of serving these
communities.



What are the PROBLEMS?

Cultural Challenges

- Access to deploy on public lands
- Resistants Change
- MISSOURI LIP
- Lack of community knowledge

Geography

- Deployment is expensive
- Cost of Broadband may not be affordable
- Rural areas are geographically remote
- lack of access to broadband is a barrier to economic development

★ Rural MO does not have ^{adequate} internet access

Many don't know how to use it

No access to telehealth or similar

Rural folks can't afford

\$\$\$

Rural broadband is not profitable

In the beginning and the end, the most important thing is to have a good idea of what you need and what you can afford.

Affordability to consumers

Rural areas are less populated

Persona Story:
Hank is a 44 year old farmer. He lives in Texas Co and is married to Tina. They have two kids in H.S.
Tina works at the H.S. And Hank works on the farm. They live 15 miles from school library and do not have internet
Hank's kids must do homework at school/library
Success: Homework gets done
Failure: Kids cannot do homework

Broadband Table 4

Issues:

- Profitability
- Cost to implement
- Geography
- Cultural challenges

Problem Statement:

Many rural Missourians lack access to high speed internet due to the financial realities of serving these communities.

How to Get Involved

- Join the contact list for this event by emailing Casey Canfield (canfieldci@mst.edu) & Ray Walden (waldene@missouri.edu)
 - Please let us know if you are interested in helping plan these events!
- Check out our website: <https://pit-un.mst.edu/>

Thank you for joining!



Acknowledgements

- We would like to thank BJ Tanksley, Kent Sherrow, Bonnie Prigge, Chad Davis, Brett Hendrix, and Patty Reynolds for participating!



Rural Infrastructure Challenge Summit

3/1/24

Sky Room

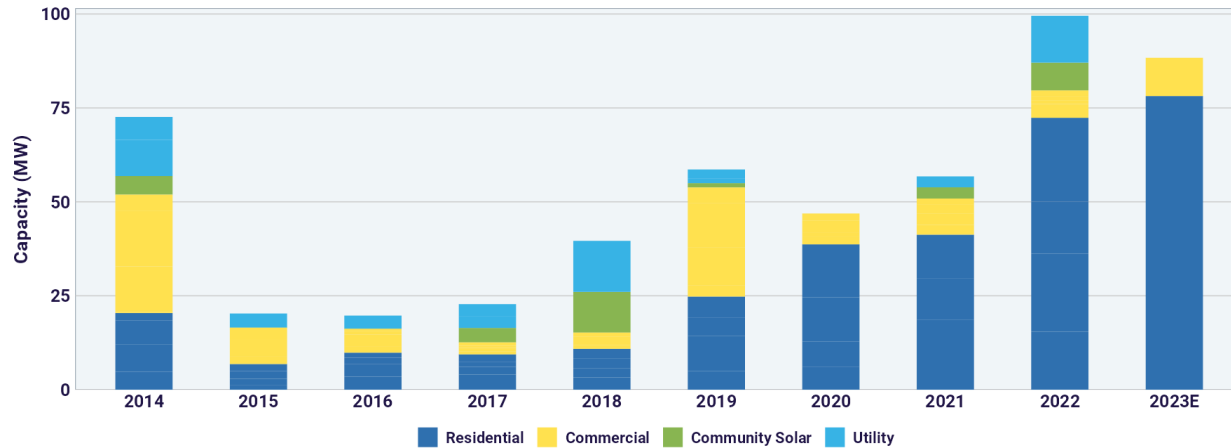
Phelps County Courthouse

“If I had an hour to solve a problem, I'd spend 55 minutes thinking about the problem and 5 minutes thinking about solutions.”

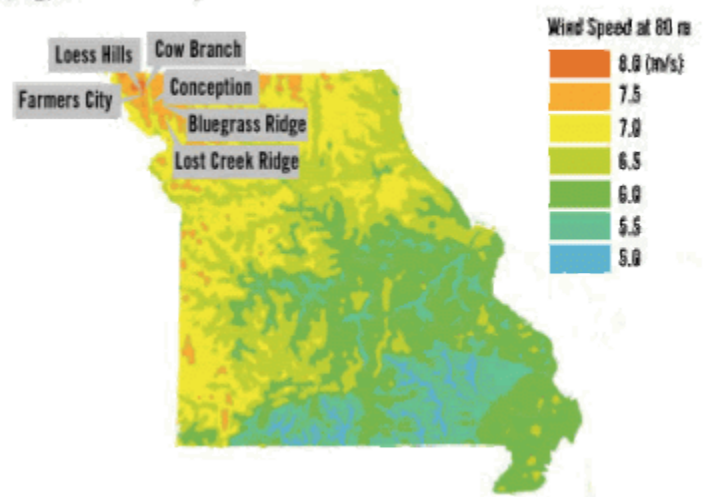
Albert Einstein

Renewable energy is growing and generation often occurs in rural areas.

Missouri Annual Solar Installations



Wind Speed and Wind Farm Locations



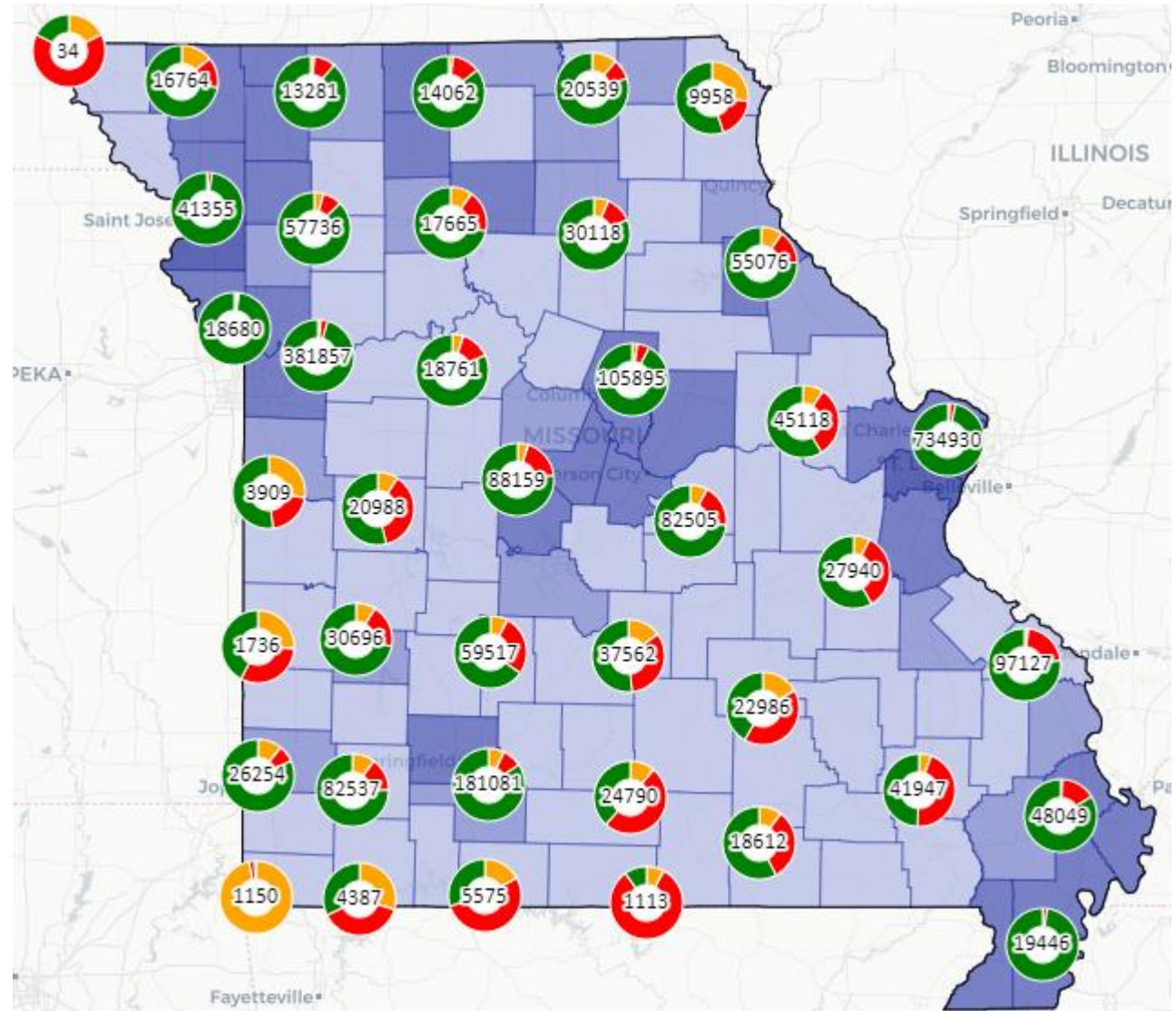
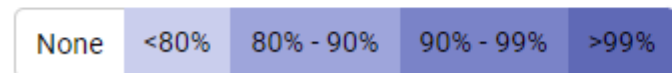
- How does this impact grid reliability?
- How does this affect the cost of electricity?
- What are the environmental impacts?
- What about transmission?
- Who wins and who loses?
- What are the workforce impacts and limitations?

Many Missourians don't have access to sufficient broadband.

- What are the technology constraints?
- What speed do people need?
- Where is there federal funding?
- What business models do we need?
- Who wins and who loses?
- What are the workforce impacts and limitations?

State Total Servicable Locations:
Missouri 2,509,404

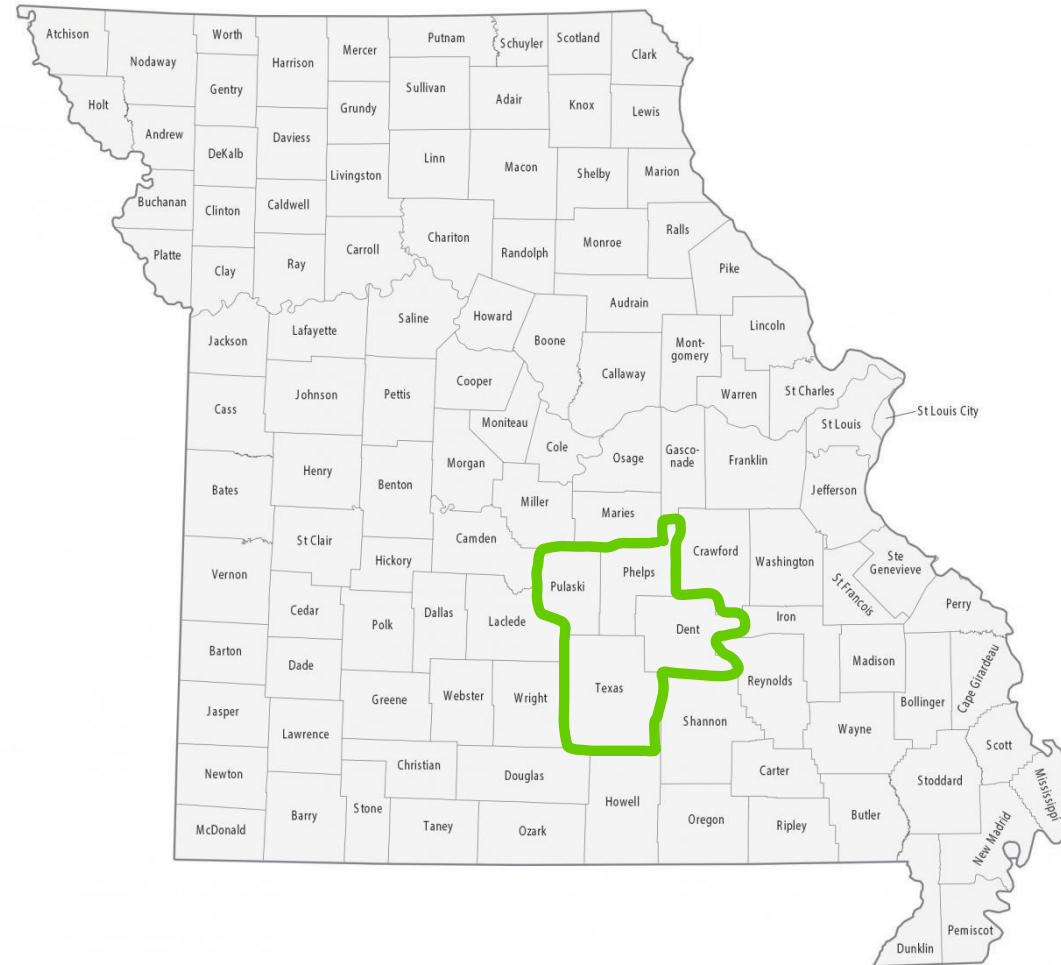
Locations with at least 100/20 Mbps service



There are many problems to address that cut across both energy and broadband.

- Business Models
- Regulation
- Policy
- Technology
- Literacy
- Equity
- Coordination
- Environmental
- Financial
- Demand vs. Supply
- Economic Development
- Health Outcomes
- Education Outcomes
- Workforce

Focus on Phelps, Pulaski, Dent & Texas counties.



We all bring a different perspective.



This is just the first step.

- Missouri S&T has joined the Public Interest Technology University Network!
- Public interest technology (PIT) refers to a set of practices to design, deploy and govern technology in ways that advance the public interest
- Interdisciplinary by nature, it involves the ability to assess and respond to the core ethical, legal, policy, social, economic and political implications of technology

Rural Infrastructure Challenge Summit



Problem Identification

- > Step 1: State the issues
- > Step 2: Determine the root causes
- > Step 3: Draft problem statement (no solutions)
- > Step 4: Determine principal adopters, create user stories



Problem Identification

- > Step 1a:
- > State the issues
 - Using Post-it notes, each person should write issues (one per note). Keep customer in mind.
 - Be as specific and measurable as possible.
 - Think about:
 - > What is the problem? Why is it a problem? Who has the problem? When and where does the problem occur? How is it solved today?

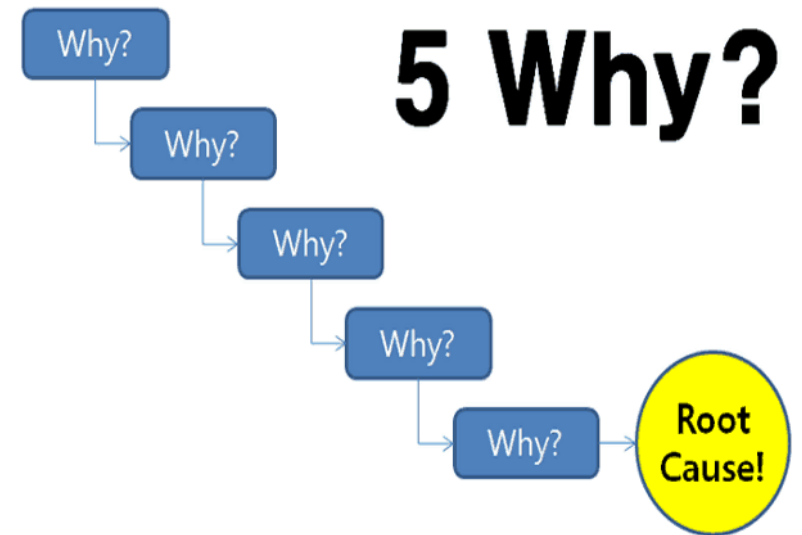
Problem Identification

- > Step 1B:
- > Prioritize the list of issues
 - Group the common issues
 - Prioritize using sticky dots



Problem Identification

- > Step 2
 - Determine root cause
 - Go step by step to determine why you are having the issue.
 - Keep asking as long as it makes sense



Problem Identification

> Step 2 Example

- > *Why was the hospital's new health care app delayed by 4 weeks?*

Answer: Additional complexities were revealed in the testing phase.

- > *Why did additional difficulties come up?*

Answer: The creation phase did not include a solution for a major use case.

- > *Why did the creation phase miss a major use case?*

Answer: The original brainstorming sessions did not include employees from the department.

- > *Why were key employees missing from the brainstorming sessions?*

Answer: The brainstorming session was led by a particular department. In this case, additional departments were brought in later in the development process.

- > *Why is this process managed by a particular department?*

Answer: This is how it's always been done.

Problem Identification

> Step 3

- Draft problem statement
- This contains no solutions at this point
- Use data if possible

> Example

- Sales have dropped by 20% in last year due to slowing interests in product.

Problem Identification

> Step 4a

- Identify Principal Adopters
- What group is directly affected by this problem?
Be specific here.
- Would it be the customer?

Problem Identification

> Step 4b

– User stories

- > Create fictitious people who are from different demographic areas and have different needs.
- > Give them a name, personality and some personal information.
- > Create a user story that states why they are affected by the problem and what they see as success and failure.



Problem Identification

> Step 4b example

- Wanda Harris, 43, ran track in college. Has a 15-year-old daughter who runs track. Also has some mobility issues.
- User Story: Wants to be able to watch her daughter's track meets without pain.
 - > Success means she can sit comfortably during the track meet even if it goes on all day and is able to move around as needed
 - > Failure means she is unable to get to the event easily