Waller County Initiative | Problem Statements for TEES SME Engagement

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Submitted By: Quantum America in partnership with the Texas A&M Engineering Experiment Station (TEES)

Workshop Dates: September 4–5, 2025 (proposed)

Location: Texas A&M University, College Station

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1. Precision-Built Housing & Modular Construction

Problem Statement:

How can we design, test, and deploy highly energy-efficient, precision-built modular homes that meet or exceed DOE Zero Energy Ready and IBHS Fortified Gold standards—while reducing total monthly cost of ownership in rural Texas?

Areas of Expertise:

- Advanced building materials
- Structural engineering (framing, foundation systems)
- Modular and off-site construction methods
- Energy modeling for high-performance homes
- Housing certification (DOE ZERH, IBHS Fortified, etc.)

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2. Energy Systems & Resilience

Problem Statement:

How can we integrate distributed solar, battery storage, and microgrid technologies to create energy-resilient rural housing districts—including mechanisms for virtual power plants and bi-directional vehicle-to-grid systems?

Areas of Expertise:

- Solar photovoltaic (PV) system design & integration (e.g., Qcells VPP)
- Microgrids and virtual power plants (VPPs)
- Battery storage systems (residential & community-scale)
- Grid resilience & energy equity
- Building decarbonization strategies

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3. Water Infrastructure & Resiliency

Problem Statement:

What scalable technologies and strategies can enable decentralized, resilient water systems (including greywater reuse and stormwater management) for rural mini-districts with limited access to centralized municipal services?

Areas of Expertise:

- Decentralized water systems
- Greywater reuse and stormwater management
- Rural water distribution & reliability
- Agricultural and residential water efficiency
- Integrated water-energy nexus research

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4. Telehealth & Health Technology Integration

Problem Statement:

How can we design homes and neighborhoods that embed telehealth-ready infrastructure—including real-time diagnostics, wearables, and chronic care support—to address healthcare access gaps in rural areas?

Areas of Expertise:

- Remote monitoring & in-home diagnostics
- Rural healthcare delivery models
- Smart home health sensors & wearables
- Health equity and care access modeling
- Behavioral health, aging in place, and chronic care

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5. Transportation & Smart Mobility

Problem Statement:

What smart mobility solutions—including EV charging infrastructure and safe pedestrian networks—can be prototyped in rural environments to ensure long-term access, safety, and future-ready community connectivity?

Areas of Expertise:

- EV infrastructure & vehicle-to-grid (V2G) systems
- Autonomous vehicle testing zones
- Smart streets and pedestrian-safe design
- Connected mobility systems for rural areas

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6. Broadband & Digital Infrastructure

Problem Statement:

How do we deploy cost-effective, secure, high-speed broadband (e.g., FTTH, edge computing) in rural housing developments to support digital equity, telework, remote learning, and telehealth—while safeguarding network security?

Areas of Expertise:

- Fiber-to-the-home (FTTH) design
- Rural broadband deployment strategies
- Edge computing and connectivity hubs
- Cybersecurity for community networks

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7. Land Use Planning & Rural Real Estate Development

Problem Statement:

What regulatory, planning, and development models (zoning, utility districts, land valuation) enable rapid deployment of rural housing while protecting landowner equity and reducing approval friction?

Areas of Expertise:

- Zoning reform and entitlement pathways
- Rural subdivision and platting expertise
- Land valuation & site selection analytics
- Affordable land development modeling
- Utility district planning and governance

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8. Workforce Development & Economic Inclusion

Problem Statement:

How can the Waller County Initiative support the creation of scalable workforce development pipelines for construction, clean energy, digital infrastructure, and telehealth—including credentialing, apprenticeships, and veteran inclusion?

Areas of Expertise:

- Skilled trades curriculum (construction, electrical, plumbing, etc.)

- Green job pathways (solar techs, energy auditors, etc.)
- K-12 and dual-credit STEM programs
- Entrepreneurship incubators & maker spaces
- Veteran and second-chance workforce integration

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9. Finance & Affordable Housing Innovation

Problem Statement:

What new financial instruments (e.g., lease-to-own models, CDFI partnerships, resilience-backed mortgages) can be deployed to enable rural homeownership, credit building, and sustainable housing affordability?

Areas of Expertise:

- Lease-to-own modeling
- Credit building & mortgage readiness education
- Capital stack structuring for rural projects
- CDFIs, state housing finance agency tools
- Resilience-backed mortgage underwriting

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10. Community Engagement & Public Policy

Problem Statement:

What community-centered engagement strategies and public policy frameworks can support trust-building, equitable participation, and sustained cross-sector collaboration in rural development?

Areas of Expertise:

- Rural stakeholder engagement strategies
- Equity-driven urban and rural planning

- Interagency collaboration frameworks
- County & state coordination models
- Institutional trust-building with underserved populations

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11. Climate Adaptation & Environmental Resilience

Problem Statement:

How can we design homes and infrastructure to withstand extreme weather events—such as floods, droughts, wildfires, and heat waves—while reducing carbon emissions and enabling passive survivability?

Areas of Expertise:

- Flood risk modeling and mitigation
- Wildfire and heat resilience design
- Nature-based stormwater solutions
- Passive design strategies for extreme heat/cold
- Disaster recovery and community re-entry planning

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12. Food Security & Local Agriculture

Problem Statement:

How can we integrate local food systems, agriculture innovation, and community-supported models (CSA, urban gardens) into rural residential developments to address food insecurity and promote resilience?

Areas of Expertise:

- Community-supported agriculture (CSA) models
- Rural food desert intervention strategies
- AgriLife Extension expertise on nutrition, soil, and yield

- Integration of food systems into rural planning

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13. Behavioral & Social Sciences Integration

Problem Statement:

How do human behavior, cultural alignment, and social resilience influence the adoption of smart technologies, health systems, and housing innovations in rural communities?

Areas of Expertise:

- Human factors in smart homes
- Community resilience & cohesion metrics
- Health & wellness behavior modeling
- Sociotechnical systems for rural planning
- Adoption behavior and cultural alignment

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14. Construction Science & Project Delivery

Problem Statement:

What construction delivery models—including high-volume rollout, just-in-time logistics, and factory integration—can accelerate rural housing delivery while ensuring quality, safety, and cost control?

Areas of Expertise:

- High-volume rollout (HVR) construction
- Prefabrication & just-in-time logistics
- QA/QC protocols in modular building
- Permitting & inspection optimization
- Workforce safety and jobsite digitization

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15. Education & Institutional Partnerships

Problem Statement:

How can TEES and Texas A&M System institutions collaborate with K–12 and higher ed systems to develop a replicable Living Lab curriculum model that supports student engagement, applied research, and rural STEM education?

Areas of Expertise:

- Living lab curriculum development
- Research internships and fellowships
- University–industry co-creation programs
- STEM pipeline development with rural schools