

VIRGINIA ENERGY RESILIENCE STUDY: SUMMARY OF FINDINGS & PLANNING TOOLS

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ACKNOWLEDGEMENTS

This report summarizes the findings and planning tools developed through the Virginia Energy Resilience Study, led by the Virginia Department of Energy (Virginia Energy). Virginia Energy provided project leadership and coordination, bringing together research, engineering, community engagement, and local government partners to help Virginia communities better prepare for extended power outages.

The study benefited from the contributions of James Madison University's Center for the Advancement of Sustainable Energy, Resilient Virginia, Appalachian Voices, APTIM, American Microgrid Solutions, Leslie King Consulting, and Launch! Consulting, Inc. Their collective work supported resilience assessment, development of planning and scoring tools, community engagement, and evaluation of locally appropriate energy solutions.

Special appreciation is extended to the participating local governments, emergency management personnel, community organizations, service providers, and residents who contributed their time, knowledge, and experiences. Their participation grounded the study in local priorities and helped identify practical opportunities to strengthen essential services and support vulnerable households during power outages.

STUDY PURPOSE AND SCOPE

The Virginia Energy Resilience Study (VERS) developed a practical approach for helping communities understand their vulnerability to extended power outages and identify improvements that protect residents and maintain essential services. The study combined local assessments, community engagement, and engineering analyses with a reusable [Community Energy Resilience Scoring Tool](#) and [companion Planning Guide](#). Together, these resources connect residents' experiences with a structured assessment of service continuity, backup power, and the capacity to assist vulnerable households.

The [December 2025 case-study report](#) documents planning and engineering work for Blacksburg, Clinchco, Dante, Dungannon, Emporia, Galax, Onancock, Richmond, Buchanan County, and Wachapreague. These locations represent different circumstances, including rural isolation, mountainous terrain, coastal hazards, urban neighborhoods, and limited municipal resources. The report primarily documents assessed needs, proposed solutions, and implementation considerations. It does not establish that all proposed systems have been installed or that their anticipated benefits have been demonstrated during actual outages. The January 2026 scoring workbook provides a reusable assessment template rather than a compiled dataset of results for the participating communities.

KEY FINDINGS ACROSS COMMUNITIES

A central finding is that energy resilience depends on the continuity of interconnected services. A community may have backup power for an emergency operations center while lacking reliable electricity for water pumps, grocery stores, pharmacies, fuel distribution, or communications. These gaps can undermine the broader response. Fuel-powered generators depend on accessible fuel supplies, functioning pumps, and delivery routes. Public alerts depend on residents having charged devices and access to communications networks. An emergency shelter depends on transportation, staffing, supplies, and the ability to sustain its power source. Effective planning therefore requires an understanding of how services depend on one another.

The assessments also demonstrate the importance of outage duration. Services that can withstand a brief interruption may become unavailable after one or several days. In Blacksburg, the case study reported that many public health and safety services could operate for approximately two to three days, while several emergency management functions had substantially longer operating capacity. In Galax, many assessed services had one day or less of operating capability, although some functions could continue considerably longer. These differences show why a general statement that a community "has backup power" provides insufficient information. Communities need to know which services can continue, for how long, and what happens when fuel, battery capacity, or other supporting resources are exhausted.

Household vulnerability emerged as another major concern. Residents who depend on electrically powered medical equipment, home health caregivers, well water, or assistance with transportation can face heightened risks during an outage. Limited English proficiency can restrict access to emergency information, while limited financial resources can prevent households from relocating or adequately heating and cooling their homes. Several case studies identified gaps in the ability to locate residents needing assistance, conduct wellness checks, provide accessible alerts, or arrange transportation. Informal volunteer networks provided important support, but the findings also pointed to the need for clearer coordination and more dependable arrangements.

Community engagement helped translate these concerns into priorities for resilience hubs. Residents identified needs extending beyond electricity, including food and water distribution, medication refrigeration, communications, charging, heating and cooling, transportation, and assistance for homebound residents. Participants also expressed interest in facilities that support everyday activities, such as youth programs, senior services, education, and community gatherings. These findings support locating hubs in familiar, accessible places with established community relationships. They also demonstrate that successful hubs require an operating plan and defined services, alongside an energy system.

LOCAL SOLUTIONS AND IMPLEMENTATION CHALLENGES

The local examples illustrate why solutions must reflect community conditions. Clinchco identified its Missionary Baptist Church as a potential hub because it already offered useful amenities and a familiar gathering place. However, flood exposure, limited access routes, and dependence on services outside town complicated the planning. Dante evaluated both a stationary system at the Depot and mobile solar and battery equipment. Mountain shading, flood risks, property constraints, and the need to maintain water pumping influenced those options. These cases show how geography and access can affect both technical feasibility and residents' ability to benefit from a project.

Dungannon demonstrated the value of combining efficiency improvements, energy affordability, and phased implementation. The Depot received building improvements identified through an energy audit, with an estimated reduction in energy use of approximately 30 percent. The community also evaluated a larger solar development intended to offset electricity use across municipal facilities. Financial, land-use, and community considerations led it toward a smaller initial approach. This experience illustrates how reducing demand and advancing a manageable project can support resilience even when a larger system appears more favorable under modeled financial assumptions.

Mobile systems offered another response where suitable buildings were unavailable, deployment flexibility was important, or additional planning was needed. Emporia

pursued a mobile solar and storage unit as an interim option while considering a permanent hub. Richmond's engineering analysis addressed mobile support for residents, including seniors and public housing communities. The Buchanan County and Wachapreague sections also examined mobile equipment. These proposals have different intended uses and capacities: a unit designed for charging and small devices cannot automatically be assumed to power an entire building or a pumping station. Its operating duration depends on the connected loads, stored energy, and opportunities to recharge.

Across the cases, funding and organizational capacity remained persistent barriers. Solar generation may reduce ordinary electricity costs, while batteries, additional backup generation, and emergency operating arrangements introduce costs that may not be recovered through utility savings alone. The Dante analysis projected negative long-term cash flow for its combined stationary system under the study's assumptions, demonstrating the potential need for grant support where resilience is the primary benefit. Communities also identified limited staff time, coordination challenges, and the need for continuing maintenance and operational funding. Early engagement and clearly assigned responsibilities are therefore important parts of implementation. These findings are documented in the study's case-study report.

PLANNING TOOLS DEVELOPED

The Community Energy Resilience Scoring Tool and Planning Guide provide a repeatable method for examining these issues. Their purpose is to assess readiness for extended electricity outages and help communities identify areas for improvement. The framework covers 32 assessment items organized into four areas: public health and safety, emergency management, community necessities, and support of vulnerable households. Each area contains eight items. This structure brings public services, businesses, infrastructure, and household support into a common assessment process.

The public health and safety area includes services such as emergency calling, fire protection, ambulance response, acute medical care, police, water, wastewater, and trash collection. Emergency management addresses functions including command centers, shelters, distribution of necessities, public communications, special-needs transportation, animal shelters, debris clearing, and search and rescue. Community necessities include communications access, public transportation, local broadcasting, food assistance, grocery stores, fuel stations, pharmacies, and banking. The household area examines the community's ability to identify and assist residents facing specific vulnerabilities.

The Planning Guide recommends a small assessment team, generally two to four people, supported by conversations with service providers and other stakeholders. Members should bring local knowledge and connections to municipal operations, public safety, businesses, social services, or neighborhood organizations. The team first defines the

geographic area being assessed and identifies which services are present. It then investigates backup power and household-support capabilities before reviewing the resulting scores. The guide supplies interview prompts and advice for handling uncertain information or multiple providers of the same service. This makes the assessment accessible to communities without requiring a specialized quantitative risk-analysis team.

For the first three assessment areas, ratings are based on how long a service can continue during an outage, assuming its buildings and equipment have not suffered physical or structural damage. The published scale assigns 0 to no operating capability or backup power; 0.5 to one day or less; 1 to one to three days; 2 to four to seven days; 3 to one to two weeks; and 4 to more than two weeks. The guide connects these categories to progressively longer and more consequential outages. It encourages conservative estimates and consideration of refueling, recharging, and other dependencies that could shorten operating time.

Household-support ratings use a different basis: the community's social and organizational capacity. The scale progresses from no capability, through informal volunteer experience or formal plans, to established responses supported by both volunteer activity and official plans that have been used previously. The assessment addresses transportation, well-water access, language barriers, medical equipment, caregivers, and protection from unsafe indoor temperatures. It also includes warming and cooling support during temperature extremes when electricity remains available, recognizing that affordability and access can create energy vulnerability even without an outage. The framework and its application are explained in the [Community Energy Resilience Scoring Tool Planning Guide](#).

The Excel workbook turns this framework into an organized assessment and reporting tool. Four input worksheets use dropdown selections to record service availability, operating duration, and household-support capability. Formulas assign ratings and calculate average scores. An "All Scores" worksheet consolidates the individual ratings, while the "Resilience Results" worksheet presents an overall score, interpretations, and charts showing the distribution of ratings and differences among the four assessment areas. A separate "Vulnerability Analysis" worksheet assembles information for the next stage of planning. The workbook includes input guidance, explanatory messages, and worksheets configured for single-page printing.

These outputs help users communicate findings while retaining the detail needed to identify weak points. An average score can summarize overall readiness, but it can also conceal a critical service with little or no backup capability. The workbook therefore presents individual ratings alongside broader results. Its instructions emphasize completing all assessment items before interpreting the dashboard. Because the supplied file is an uncompleted template, its default displays should not be treated as findings about any particular locality. The features described here are contained in the [January 16, 2026 scoring workbook](#).

USING THE RESULTS TO SET PRIORITIES

The vulnerability-analysis process helps communities move from scores to decisions. It examines five topics: gaps in locally available services; services with no backup or very limited backup; services that could benefit from longer operating capability; dependencies among services and energy systems; and support for vulnerable households. The analysis uses qualitative questions to identify when a service would fail, who would be affected, and how serious the consequences could be. Potential responses include additional backup power, lower energy demand, stronger fuel arrangements, coordination with neighboring providers, mobile charging, resilience hubs, and improved household assistance.

The guide also establishes important limits. The scores do not replace emergency management or hazard-mitigation plans, assess all physical disaster risks, or automatically determine a community's most important priorities. Services located outside the assessment area can create significant dependencies even when they are excluded from scoring. The method is best suited to incorporated towns and cities, with potential applications to county seats and smaller counties; large cities and other settings require careful attention to geographic scope and complexity. These qualifications make the individual findings and local discussion essential to interpreting the numerical results.

Taken together, the case studies and tools provide a practical foundation for continued resilience planning. Communities can establish a baseline, identify service and household-support gaps, select priorities, and commission the technical work needed for implementation. Repeating the assessment can help track changes in capability over time. The study's broader contribution is to connect investments in backup energy with the services residents need and the organizations responsible for delivering them. Progress depends on aligning equipment, accessible facilities, community relationships, operating arrangements, and sustained resources around clearly defined local needs.

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