

# The Energy-Resilient City

Learn about the different ways a city can incorporate resilience:

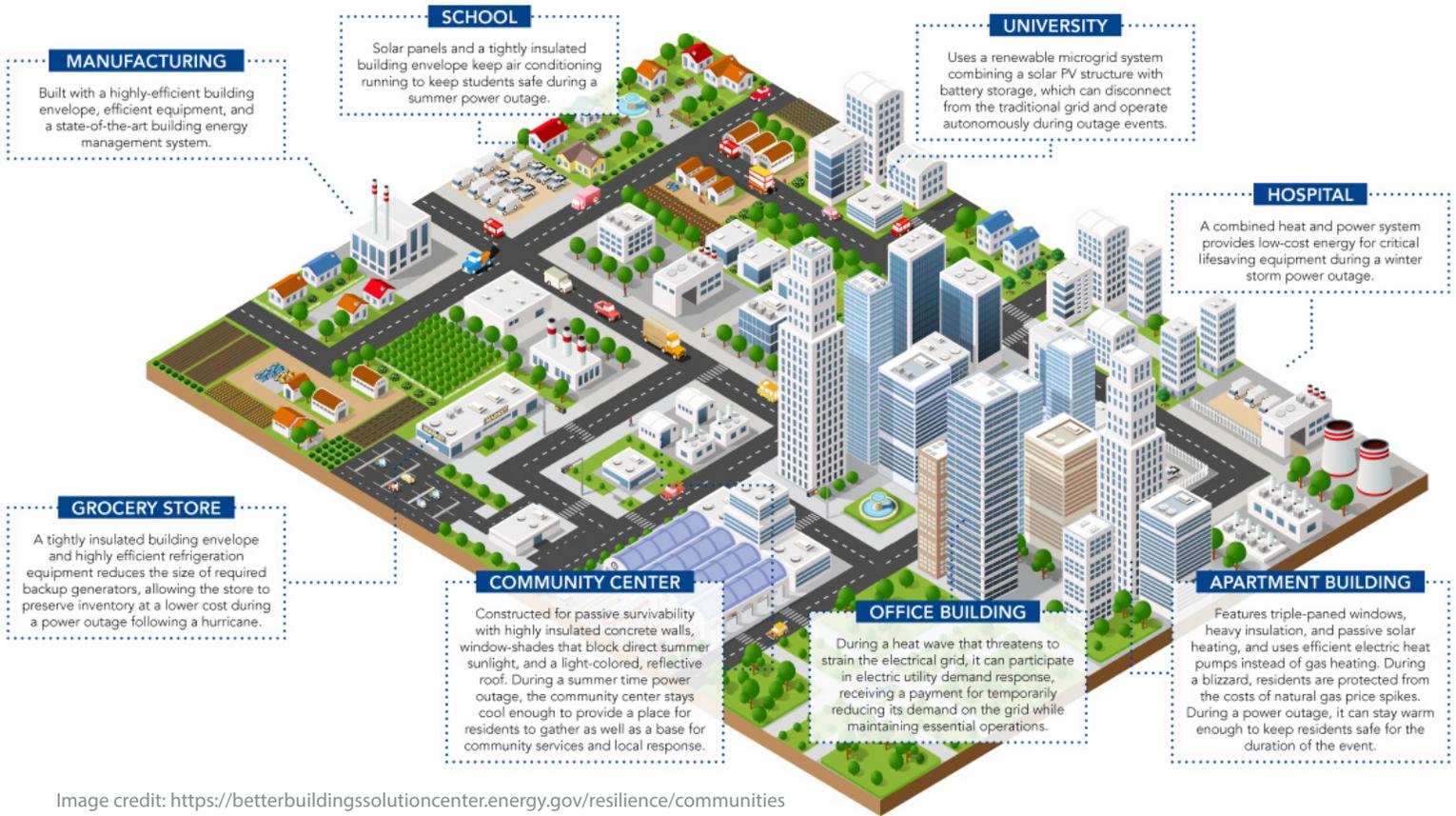


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## Energy Codes & Energy Resilience

Energy Codes dictate building performance related to energy use and conservation through design, materials, and methods of construction. The Codes provide the bare minimum performance requirements for building components and systems while allowing for design flexibility, encouraging the use of new construction techniques and materials that result in better performing, more durable, and resilient structures. Therefore, energy codes and other model building codes push for continual improvement in our built environment helping to ensure energy resilience for all.

### What is Energy Resilience?

Energy Resilience is the ability to operate building energy systems (lighting, HVAC, critical plug loads, etc.) during major disruptions. This concept has two components: Passive Resilience and Grid Resilience.

**Passive Resilience** is the ability to maintain habitable conditions during a utility outage or loss of energy supply, including thermal comfort and safe interior conditions.

**Grid Resilience** encapsulates technologies that provide efficiency and grid flexibility such as thermal and electrical energy storage, load shifting, and demand management. Grid resilience means grid services will be consistently supplied during peak hours, demand-side loads are reduced, and the risk of a community scale power system failure is decreased.

Taken together these components help ensure **Community Resilience**, which the American Council for an Energy Efficient Economy (ACEEE) [defines](#) as “a community’s reduction of and preparation for risk”.

## Thermal Resilience Due to Increased Insulation

### Improved Thermal Comfort During Outages

In the event of long power outages, a code compliant building will be better able to maintain safe and comfortable temperatures than non-compliant buildings. While power may be knocked out for days due to a severe storm, buildings with a well-insulated and air resistant envelope, limit heat loss and drafts, which can affect occupant comfort and health.

To quantify the improved performance and enhanced resilience of code compliant buildings, the U.S. Department of Energy (DOE) published a new report titled "[Enhancing Resilience in Buildings Through Energy Efficiency](#)" in 2023. The analysis finds a building built to comply with the 2021 International Energy Conservation Code (IECC) can reduce mortality from extreme heat by 8%-53%, depending on Climate Zone, when compared to a building built in compliance with the 2006 IECC.

The analysis also demonstrates that code compliant buildings help to ensure community resilience is maintained. Code compliant buildings throughout a community will have the increased passive resilience described above: those sheltering in place can remain in their building longer. This resilience may also provide emergency crews more time to reach those in urgent need of help. The more buildings within a community that can effectively serve as shelter after a major emergency, the more resilient that community is.

### Reduced Utility Costs

Code compliant, energy efficient buildings can achieve and maintain comfortable interior conditions using fewer energy resources than non-compliant buildings, so overall energy costs are reduced. Code compliant buildings also improve community resilience as lower yearly energy costs mean lower operating costs and more financial stability for building and home owners. During severe weather, a code compliant building will see lower heating or cooling costs compared to their non-compliant neighbors. Lower energy costs can help keep energy consumers, and even entire communities, afloat during times of emergency or financial challenges.

## Improved Durability

Air tightness and building durability are crucial components of passive resilience. Combined with thermal improvements, air resistant assemblies reduce condensation risk by limiting moisture movement. During prolonged power outages, humidity build-up in buildings can cause mold, mildew, rot, or freeze damage. More air resistant and better insulated buildings reduce humid air infiltration to avoid these issues. As Code compliant construction reduces the risks of damage from water and temperature extremes, the energy and material resources needed to repair and renovate buildings is also minimized.

Extreme weather events are not the only cause of mold, mildew, and rot within buildings. Construction errors, often related to air leaks, can cause similar issues when the buildings face typical rain events or temperatures causing condensation within assemblies. Complying with the Energy Codes requires envelope testing, which can help identify air leaks before construction is completed. Energy codes also now require verification of mechanical ventilation performance to ensure the indoor environment can maintain the health of occupants. Improving the building quality in a [community has long-lasting benefits](#) in terms of property values, reduced energy dependency, improved shelter from weather extremes, and reduced health care costs related to allergens, pollutants, and temperature sensitivities.

## Reduction of Peak Demand on Energy Grid

On a community scale, more code-compliant buildings means the peak demand of the entire community is reduced, which contributes significantly to community resilience. If an extreme weather event or emergency occurs such that the electrical grid is compromised but not knocked out, a community with code-compliant buildings may be better able to use the energy it is still receiving to maintain buildings such that life and safety are ensured. Grid resilience also reduces price hikes related to weather extremes, because communities will be better able to maintain livable conditions without increasing peak energy consumption from the grid.

## Renewables and Community/Grid Resilience

The transition to renewable energy sources presents a challenge for grid resilience because of the need to integrate variable energy production (wind, solar) with varying community consumption. Typically, heat waves or extreme cold cause huge spikes in energy consumption as air conditioners or heating systems run continuously at full output for entire communities. As buildings improve in passive resilience these large peaks in consumption can be reduced, and sometimes offset to align with production rates from renewable energy sources. This makes the transition to a fully renewable grid more feasible in the future.

## Conclusion

As climate change accelerates disruptive weather events, resilience will become even more important to save lives, maintain insurability, and prevent property damage. Resiliency is significantly enhanced when buildings comply with energy codes. Code compliant buildings can better sustain their occupants and communities during and after disruptions like severe weather, extreme temperatures, and other natural disasters. It is essential, therefore, that developers and builders ensure code compliance in their buildings. Policymakers that adopt energy codes are taking important steps to provide their constituents with durable, safe, and healthy environments to live and work in.

## Further Reading

1. [Improve Community Resilience](#) - Better Buildings U.S. Department of Energy
2. [Energy Resilience](#) – Energy.gov
3. [Enhancing Community Resilience Through Energy Efficiency](#) – American Council for an Energy Efficient Economy
4. [Enhancing Resilience in Buildings Through Energy Efficiency](#) – Pacific Northwest National Laboratory

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