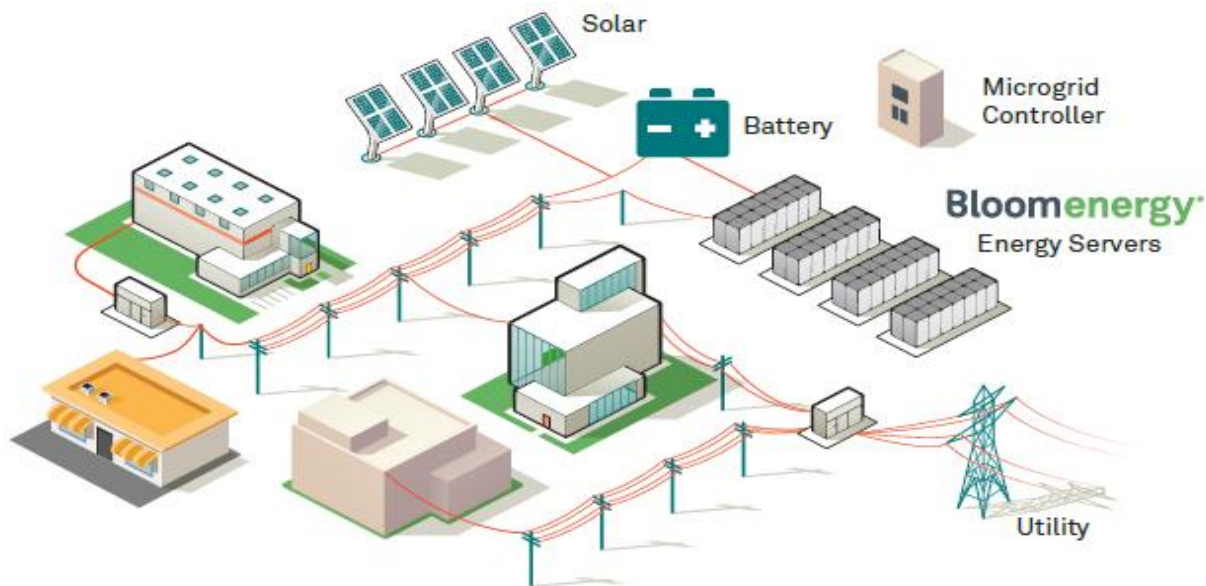


Bloom Energy: Microgrid Offerings



Bloom Energy has developed a revolutionary on-site primary power generation system. The Bloom Energy Server® is based on a proprietary fuel cell technology that provides a more reliable, cleaner, and cost-effective alternative to the traditional electric grid. Bloom provides a transformational new electrical network topology that greatly simplifies the architecture and eliminates the need for many legacy components.

Microgrids are miniature versions of the centralized electric grid that dispatches, distributes, and regulates the flow of electricity. It can operate and switch between either grid connected or islanded modes. Bloom provides power generation to support critical loads for the microgrid in both modes of operation.



Anchor Generation for Microgrids

The Bloom Energy Server provides a critical foundation for building microgrids of varying complexity and can provide significant benefits to the communities and utilities they are part of.

- 24 x 7 uninterruptible power
- Avoided T&D investments
- Improved power quality
- Energy security and resilience under threats
- Air pollutant reduction
- Reduced water usage
- Power factor and voltage profile improvement

Microgrid Beneficiaries

Microgrids work best in locations with complex energy needs, and Bloom provides the foundation to meet that complexity. Below are the major entities that can benefit most from a microgrid, and the problems they would help to solve.



Utilities

- Enable high-penetration renewables
- Avoided or deferred distribution investments for T&D upgrades
- Avoided transmission energy losses
- Restoration and black start benefits

Cities & Municipalities

- Increase energy reliability and resiliency against events that cause grid outages
- Integrate cost effective solutions
- Use government incentives and programs for investment in our electrical future



Government

- Increase energy security for critical facilities
- Reduce dependence on aging infrastructure
- Reduce energy costs
- Meet increased government renewable mandates
- Reduce emissions
- Use government incentives and programs for investment in our electrical future
- Improve cost and reliability through localized energy and the associated advanced control

Commercial & Industrial

- Reduce energy costs
- Utilize increased energy market participation options
- Adopt renewable and on-site energy for sustainability
- Be a leader in technology
- Use government incentives and programs for investment in our electrical future
- Improve cost and reliability through localized energy and the associated advanced control

Microgrid Service Offerings

Community or Campus Microgrid

Towns, cities, communities, and campuses can address grid disruptions and blackouts caused by inclement weather or natural disasters with a community or campus microgrid. This gives them the option to choose their power supply and energy resiliency through a Bloom enabled microgrid. Bloom engineered microgrids allow businesses to control their energy security and meet the unique needs of each business. Through its ability to operate both in parallel to and independent from the grid, Bloom microgrids allow customers to maintain power to critical loads and provide restoration benefits during grid outages. Bloom’s Community or Campus Microgrids can maintain power to critical facilities until grid power can be restored.

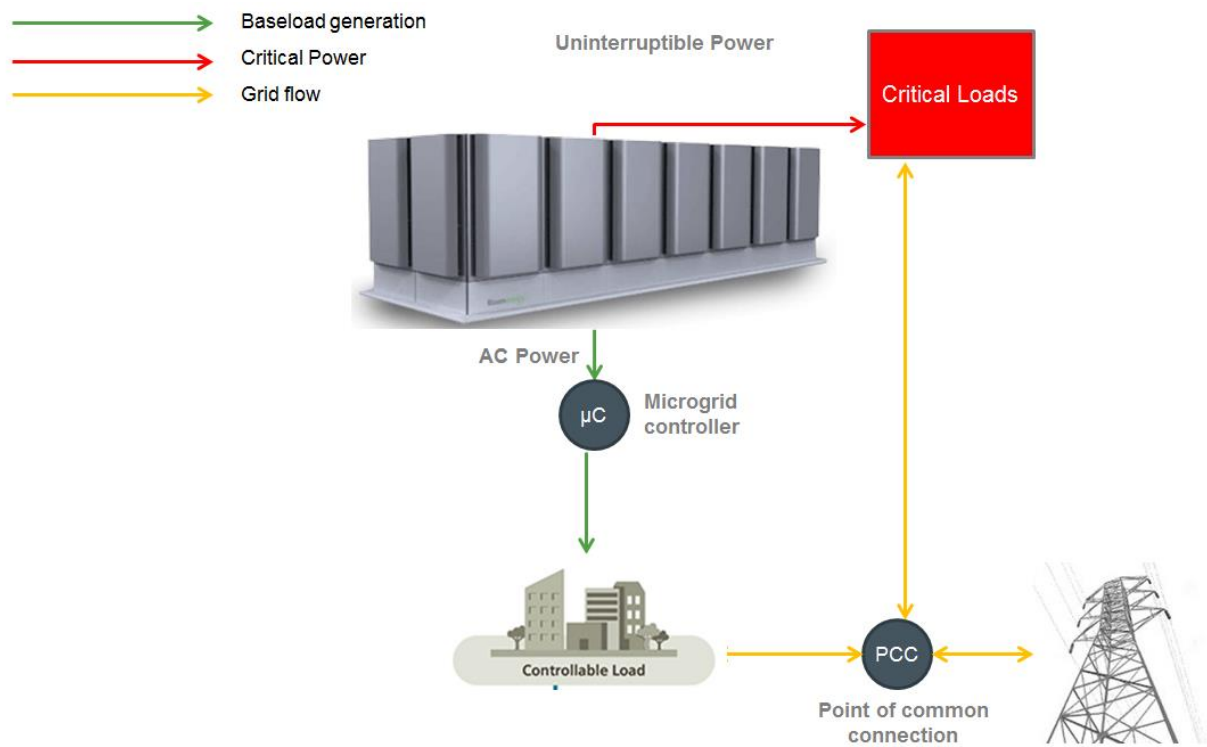


Figure 1. Diagram of the interactions within the Community-Campus Microgrid

Modes of Operation	
Grid Connected	Grid Islanded
The microgrid operates in parallel with the grid, making your community more sustainable and reducing your energy consumption from the grid.	In this mode, the microgrid will power all the critical loads in the community on the utility distribution network when there is no grid power. You can feel secure that your grocery store, gas station, police department, facilities etc. will stay powered during these extreme events.

Dynamic Integrated Microgrid

Bloom’s Dynamic Microgrid enables a flexible electric “mini-grid” and allows for the integration of numerous distributed energy resources such as solar, wind, batteries, engine generators and CHP at large scale. Focused on flexibility and its dynamic ability, a Dynamic Microgrid is a standalone electrical grid that connects and interacts with the utility grid. This enables a customer to respond to ISO price signals and participate in the energy and ancillary services markets.

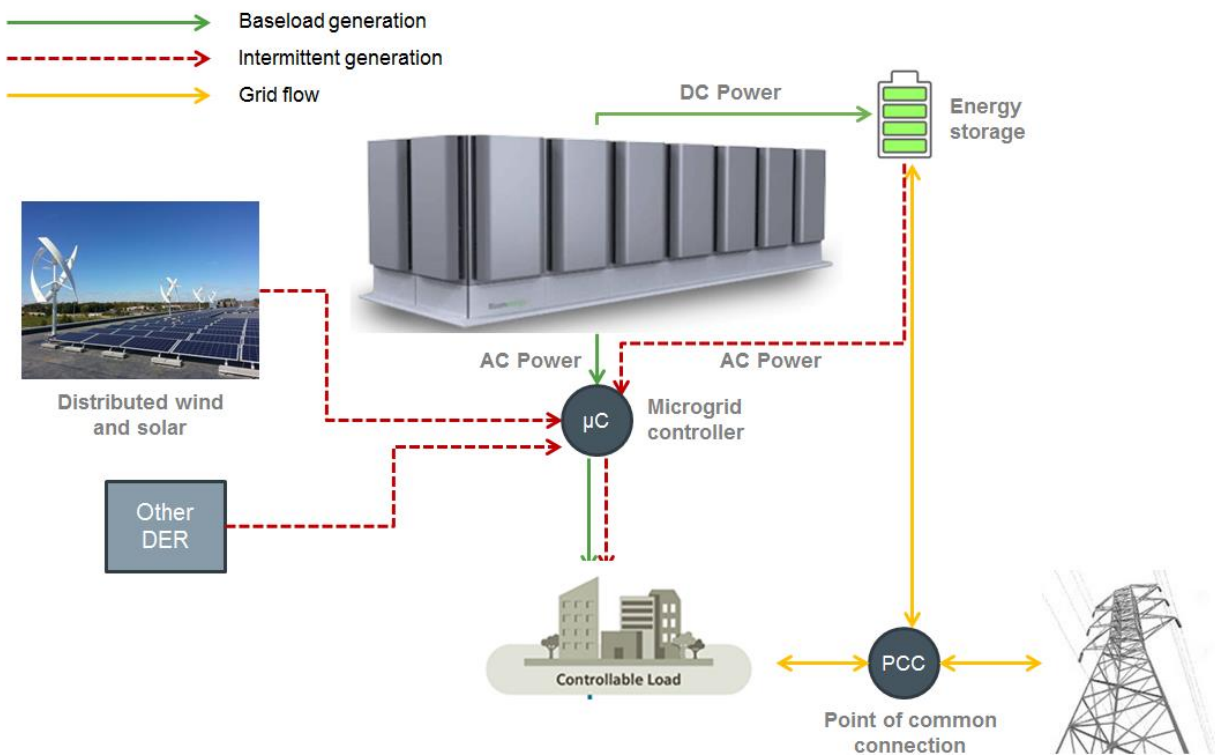


Figure 2. Diagram of the interactions within the Dynamic Integrated microgrid

Modes of Operation	
Grid Connected	Grid Islanded
The microgrid operates in parallel with grid and has the ability to import and export to the grid in response to appropriate price signals. This configuration requires sophisticated controls, testing, and integration to manage interaction with the grid.	In this mode, the microgrid controller can manipulate multiple distributed generation technologies to achieve the appropriate power output to serve customer loads. The microgrid controller ensures microgrid generation meets the campus load by turning on additional generation or shedding non-critical loads to match the supply and load. It can also assist in system restoration efforts during grid blackouts to energize certain parts of the grid.