Yerevan microgrid design

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By combining different components, a microgrid can be tailored to every customer need, providing the ideal technical and economical solution. These systems are designed to satisfy an electrical and/or thermal energy demand that is traditionally supported by the natural gas or electric utility provider. A microgrid most commonly operates in island mode, but it also can be connected to the grid.

Distributed energy resourcesThese include conventional resources, like natural gas or diesel generators, that convert fuel mechanically to make electricity and thermal energy as well as renewable systems, like solar and wind, that utilize natural resources.

Energy storageEnergy is held in reserve to be dispatched as needed to supplement other distributed assets. Systems include electrochemical (BESS), mechanical (flywheels), thermal (hot water) and energy conversion. This energy can come from the overproduction of renewables, or it can be stored/charged when energy is cheaper for use at times of peak cost.

Control systemsIntelligent controls are used to optimize the available assets to provide the lowest cost of electricity by automatically dispatching supply to the most efficient resource. For example, shutting down one generator when two are running at the highest load factor to increase fuel efficiency. Control systems can operate with or without dynamic control (smart grids).

A successful microgrid solution provides modularity, scalability, energy dispatchability, power management and balancing of resources. Whether off-grid or on-grid, these powerful and reliable distributed energy generation systems can provide high performance under any site condition.

The energy world is undergoing a transformation. Various factors are driving growth in energy demand, and encouraging the development of flexible, sustainable, cost-effective energy solutions like microgrids. As a result, microgrid capacity and revenue continues to rise all over the world.

By combining renewable power generation, power storage and conventional power generation to meet energy demands, microgrids can provide cost savings, reliability and sustainability.

Economic growth and population growth are increasing the demand for power. Increased pressure to decarbonize, and growing demand for more flexible, sustainable, cost-effective energy solutions are guiding governments and industry away from traditional energy sources like coal and gas, and toward renewable energies such as solar and wind power.

Systems must be in place to ensure power to communities in extreme conditions. An outdated and overstressed grid has made the network more susceptible to outages. For example, in July 2019, with only 45

minutes of notice, Con Edison had to shut down power to New York City residents when a section of its system reached a maximum capacity of 12,063 MW. In Northern California, PG& E has been proactively shutting down power through rolling blackouts to avoid the risk of fire during high-risk times of the year.

The increase in non-dispatchable renewable generation in the form of grid-scale wind and solar has added to the overall instability of the grid. Solar power, wind power and other renewable energy sources offer key benefits, but there are some drawbacks as they are dependent on weather and time-of-day, can suffer output fluctuations, and often require major capital investment. A smart microgrid uses storage and/or complementary generation technologies to optimize the use of renewables.

Upgrades to the grid are becoming more and more important due to the overall age of the transmission and distribution network. The U.S. Department of Energy (DOE) reports that 70% of power transformers are 25 years of age or older, 60% of circuit breakers are 30 years or older, and 70% of transmission lines are 25 years or older. The average age of the country"s 40,000 miles of transmission lines is 52 years. The need for reliable, independent access to power has never been greater.

CommercialExamples: offices, retail, warehouses, data centers, infrastructure, transport, hotels, restaurantsKey benefits: energy cost optimization, secure and reliable power supply, access to powerTypical configuration: