

Grids and Microgrids

We are all familiar with the electricity that arrives in our street & homes, but what about the people in the next town, city, or state?

In our contiguous grid, all the Australian Eastern states are interconnected into one very large network, in terms of geographic span amongst the largest, if not the largest in the world. The network is called an electrical grid.

Historically this was not always the case. Individual cities had their own generators and serviced customers within their local government area. This is why old spinning wheel electricity meters are labelled "Property of Shortland Council" in Newcastle environs or "Property of Sydney County Council" in suburban Sydney.

The 1970's saw, with increasing modernity, the need for larger generators to supply more electricity, beyond what a city-based power station could supply. In NSW this led to large power stations being built in remote areas such as Lithgow, Muswellbrook, Lake Macquarie & Snowy Hydro.

With the advent of renewable energy, a situation arises which has never existed previously. The previously mentioned centralised generators have been supplemented/ replaced by distributed generators; many on domestic rooftops.

With this diminishing need for large, centralised power stations with the energy losses associated with transporting electricity over long distances, meeting the needs of expanding communities has taken a different path. For example: In the past, as a town expands & requires more electrical energy, this would have been provided by the expensive method of upgrading the energy carrying capacity of the poles & wires connecting the town to the grid.

Today consideration is being given to making the town or community entirely or partly self-sufficient of energy.

The first case is called an isolated microgrid. The second a grid connected microgrid. The function and usefulness of microgrids can be explained by using water as an analogy for electricity. Who said water & electricity don't mix?

Let's assume that a town has a limited size water "grid" supply line pipe & expanding water consumption; mostly during the daylight hours when people are active. The resulting lack of water pressure at peoples' homes can be resolved by building a water storage tank near to where people live. If that storage tank is large enough, then during the night that otherwise limited water supply line will be able to fill the tank so that during the following day the constrained water supply in conjunction with the water flow from the storage tank will keep everyone happy. We have is the water equivalent of a grid connected electrical microgrid, a situation long present in many towns.

An improvement on the water supply example: Let's connect all the rooftops to the storage tank so that the storage tank stores not only water from the supply grid but also water gathered locally. This additional step has reduced the dependency on the water coming remotely from the water grid.

Maybe that local gathering of water makes the supply line from the grid redundant & the attendant maintenance costs unnecessary. We could disconnect the line. Then we have then the equivalent of an isolated microgrid. If we elect to keep the supply line in place, we have a connected microgrid. In a new town or community, we might even consider not having a grid connected water supply at all & just rely on locally gathered water. This is like an isolated microgrid. The water storage tank is like a community battery, the rooftop water analogy is distributed energy sources & the grid water supply line the electricity grid feeder line.

